MEMORANDUM

To:	EPA
Copy To:	File 80021
From:	J. Lambert, J. Brunelle
Subject:	Olin – Groundwater trend evaluation for wells associated with East Ditch and South Ditch
Date:	10/1/19

This Technical Memorandum (Memo) provides a trend evaluation for contaminants of concern in surface water at the Olin Chemical Superfund Site (the Site), including ammonia, bis(2-ethylhexyl)phthalate (BEHP), and chromium. Nobis Group® (Nobis) used the EPA Groundwater Statistics Tool to evaluate trends in wells where data were available for analysis.

1.0 TREND EVALUATION METHOD

The Groundwater Statistics Tool is a Microsoft Excel-based program that provides trend analyses of groundwater data (EPA, 2014). The program performs the following:

- Outlier testing with a Dixon's test, using modifiable confidence levels (default of 1 percent, options of 10, 5, and 0.5 percent);
- Normality testing using a Shapiro-Wilk test, using confidence levels based on data set size;
- Mean, linear trend, and upper confidence band calculation using the either the Student's-t, KM Chebyshev, or Chebyshev methods, depending on detection frequency and normality of the data set; and
- Linear trends and confidence bands calculations using linear regression or the Mann-Kendall test depending on the normality of the data set.

The trend analysis used the default confidence levels for the Dixon's test and the "remediation" monitoring phase. The remediation monitoring phase analysis uses groundwater monitoring data to evaluate contaminant migration and changes in contaminant concentrations over time.

Nobis Group®
585 Middlesex Street
Lowell, MA 01851
T (978) 863-0891

The Groundwater Statistics Tool has a maximum of 20 data points available for entry. For sample locations with more than 20 data points, only data from the last 20 sampling events were used. Data that were rejected after data validation were not included in the count of 20 available events. In addition, the tool has a function that requires removal of data with anomalously high detection limits relative to detected data; therefore, Nobis omitted flagged data meeting this condition.

The Groundwater Statistics Tool includes a function to compare values to a screening level. Because the software uses a default value of 0 if this field is left blank, Nobis used surface water criteria for comparison. Nobis used the national recommended water quality criteria (NRWQC) based on chronic freshwater impacts (CCC) for ammonia and chromium. For ammonia, the non-salmonid value based on a pH of 7 and average temperature of 20°C was used, resulting in a value of 7.1 mg/L (from EPA, 2013). A NRWQC value was not available for BEHP; therefore, Nobis used EPA Region 4's recommended chronic value of 3 µg/L, as developed by Suter and Tsao (1996).

The trend graphs (outputs) for the Groundwater Statistics Tool are included in Attachment A. Input screens are included in Attachment B.

2.0 EVALUATION RESULTS

Trend evaluation results are provided in Table 1. The following subsections describe the data trends for ammonia, BEHP, and chromium.

2.1 Ammonia

Nobis performed trend evaluation for 20 groundwater sampling locations with enough data for trend analysis (at least four detections).

Trend analysis for the Plant B area is as follows:

- Three locations (GW-13, GW-16R, and IW-11) had statistically significant decreases in ammonia concentrations.
- Two locations (B-03 and GW-52S) had trends ending with negative values (statistics not calculated, but a significant drop-off in concentrations).

- Two locations (GW-101 and IW-10) had statistically significant increases in concentrations.
- Two locations (GW-14, IW-6) had significantly insignificant concentration trends.
- The mean, 95% upper confidence limit (UCL), and 95% upper confidence band (UCB) for the last sample collected exceeded the surface water screening level of 7.1 mg/L for GW-14, IW-10, and IW-11.

Trend analysis for the East Ditch south of Plant B area is as follows:

- One location (GW-51S) had a statistically significant decrease in ammonia concentrations.
- Two locations (GW-4 and GW-17S) had trends ending with negative values (statistics not calculated, but a significant drop-off in concentrations).
- One location (GW-17S) had significantly insignificant concentration trends.
- The mean, 95% UCL, and 95% UCB for the last sample collected exceeded the surface water screening level of 7.1 mg/L for GW-17S and GW-51S.

Trend analysis for the South Ditch area is as follows:

- Three locations (GW-78S, GW-79S, and PZ-16RRR) had statistically significant decreases in ammonia concentrations.
- Four locations (GW-55S, GW-202S, PZ-17RRR, and PZ-18R) had significantly insignificant concentration trends.
- The mean, 95% UCL, and 95% UCB for the last sample collected exceeded the surface water screening level of 7.1 mg/L for all seven locations.

2.2 BEHP

Olin did not consistently include BEHP in the analyte list for all locations, and BEHP was not frequently detected in sampled wells; therefore, only a limited number of locations had enough data for trend evaluation. Statistics could only be performed for a few wells located in the Plant B area:

- Four locations (GW-13, GW-101, IW-6, and IW-10) had trends ending with negative values (statistics not calculated, but a significant drop-off in concentrations).

- Two locations (GW-101 and IW-10) had statistically significant increases in concentrations.
- One location (IW-11) had statistically insignificant groundwater trends using all available data; however, this appears to be the result of an extremely large increase in concentrations (several orders of magnitude) starting in November 1990 and ending before December 1996.
- The mean, 95% upper confidence limit (UCL), and 95% upper confidence band (UCB) for the last sample collected exceeded the surface water screening level of 3 µg/L by several orders of magnitude for IW-11 (the only location for which statistics were available).

2.3 Chromium

Nobis performed trend evaluation for seven groundwater sampling locations with enough data for trend analysis (at least four detections). None of the locations close to the East Ditch had enough chromium detections to perform statistical analysis, so Nobis performed statistical analysis only for the South Ditch area:

- All seven locations (GW-55S, GW-78S, GW-79S, GW-202S, PZ-16RRR, PZ-17RRR, and PZ-18R) had statistically significant groundwater trends.
- Four locations (GW-55S, GW-202S, PZ-17RRR, and PZ-18R) had significantly insignificant concentration trends.
- The 95% UCL exceeded the surface water screening level of 74 µg/L for GW-202S; all other calculated statistics for chromium were below this value.

4.0 REFERENCES

EPA, 2013. Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater. EPA 822-R-18-002. April.

EPA, 2014a. Recommended Approach for Evaluating Completion of Groundwater Restoration Remedial Actions at a Groundwater Monitoring Well. OSWER 9283.1-44, August 2014.

EPA, 2014b. Groundwater Statistics Tool User's Guide. September 2014.

Suter, G.W. and Tsao, C. L., 1996. Toxicological benchmarks for screening potential contaminants of concern for effects on aquatic biota. 1996 Revision, ES/ER/TM-96/2R.

Groundwater Statistical Tool Results
Olin Chemical Superfund Site
Wilmington, Massachusetts

Well ID	Indicator Chemical	Units	First Sampling Event Date	Last Sampling Event Date	Conc. Mean	95% UCL	95% UCB at last sampling event	Calculated Slope Trend	Qualitative Trend
Plant B Area									
B-03	Ammonia*	mg/L	8/6/1999	11/28/2018	Unable to calculate - trend produces negative values				Decreasing
	BEHP	µg/L	unable to calculate - fewer than 4 detected data points						
	Chromium	µg/L	unable to calculate - fewer than 4 detected data points						
GW-13	Ammonia	mg/L	8/10/2000	11/28/2018	0.10	0.22	0.13	Decreasing	--
	BEHP	µg/L	8/15/2002	11/28/2018	Unable to calculate - trend produces negative values				Decreasing
	Chromium	µg/L	unable to calculate - fewer than 4 detected data points						
GW-14	Ammonia	mg/L	3/1/1981	10/13/2010	*23*	*58*	*120*	--	Increasing
	BEHP	µg/L	unable to calculate - fewer than 4 detected data points						
	Chromium	µg/L	unable to calculate - fewer than 4 detected data points						
GW-16R	Ammonia	mg/L	3/21/2013	3/12/2019	4.5	4.9	4.4	Decreasing	--
	BEHP	µg/L	unable to calculate - fewer than 4 detected data points						
	Chromium	µg/L	unable to calculate - fewer than 4 detected data points						
GW-52S	Ammonia	mg/L	8/1/1991	3/12/2019	Unable to calculate - trend produces negative values				Decreasing
	BEHP	µg/L	unable to calculate - fewer than 4 detected data points						
	Chromium	µg/L	unable to calculate - fewer than 4 detected data points						
GW-101	Ammonia*	mg/L	8/15/2002	3/12/2019	1.6	3.0	2.9	Increasing	--
	BEHP	µg/L	4/3/2003	11/28/2018	Unable to calculate - trend produces negative values				Decreasing
	Chromium	µg/L	unable to calculate - fewer than 4 detected data points						
IW-6	Ammonia	mg/L	8/6/1999	11/27/2018	0.7	1.0	1.0	--	No trend
	BEHP**	µg/L	2/13/1998	11/27/2018	Unable to calculate - trend produces negative values				Decreasing
	Chromium	µg/L	unable to calculate - fewer than 4 detected data points						
IW-10	Ammonia	mg/L	8/6/1999	11/27/2018	*35*	*45*	*84*	Increasing	--
	BEHP**	µg/L	8/11/1998	11/14/2017	Unable to calculate - trend produces negative values				Decreasing
	Chromium	µg/L	unable to calculate - fewer than 4 detected data points						
IW-11	Ammonia*	mg/L	11/21/1990	5/10/2006	*13*	*33*	*9.4*	Decreasing	--
	BEHP*	µg/L	5/19/1988	9/6/2013	*700,000*	*2,900,000*	*15,000,000*	--	No trend
	Chromium	µg/L			unable to calculate - fewer than 4 detected data points				

Well ID	Indicator Chemical	Units	First Sampling Event Date	Last Sampling Event Date	Conc. Mean	95% UCL	95% UCB at last sampling event	Calculated Slope Trend	Qualitative Trend
East Ditch Area South of Plant B									
GW-3S	Ammonia	mg/L	3/15/1978	3/13/2019	Unable to calculate - trend produces negative values				Decreasing
	BEHP	µg/L	unable to calculate - fewer than 4 detected data points						
	Chromium	µg/L	unable to calculate - fewer than 4 detected data points						
GW-4	Ammonia	mg/L	10/1/1982	3/19/2019	Unable to calculate - trend produces negative values				Decreasing
	BEHP	µg/L	unable to calculate - fewer than 4 detected data points						
	Chromium	µg/L	unable to calculate - fewer than 4 detected data points						
GW-17S	Ammonia	mg/L	4/1/1981	3/21/2019	*28*	*49*	*56*	--	Decreasing
	BEHP	µg/L	unable to calculate - fewer than 4 detected data points						
	Chromium	µg/L	unable to calculate - fewer than 4 detected data points						
GW-51S	Ammonia	mg/L	8/1/1991	10/18/2010	*11*	*18*	*10*	Decreasing	--
	BEHP	µg/L	unable to calculate - fewer than 4 detected data points						
	Chromium	µg/L	unable to calculate - fewer than 4 detected data points						

Well ID	Indicator Chemical	Units	First Sampling Event Date	Last Sampling Event Date	Conc. Mean	95% UCL	95% UCB at last sampling event	Calculated Slope Trend	Qualitative Trend
South Ditch Area									
GW-55S	Ammonia	mg/L	2/26/2002	3/18/2019	*220*	*260*	*300*	--	Decreasing
	BEHP	µg/L	unable to calculate - fewer than 4 detected data points						
	Chromium	µg/L	2/26/2002	3/18/2019	2.9	6.1	4.2	--	Decreasing
GW-78S	Ammonia	mg/L	5/9/2013	4/3/2019	*37*	*40*	*34*	Decreasing	--
	BEHP	µg/L	unable to calculate - fewer than 4 detected data points						
	Chromium	µg/L	5/9/2013	4/3/2019	4.2	8.9	4.9	--	No trend
GW-79S	Ammonia	mg/L	5/9/2013	4/4/2019	*73*	*84*	*80*	Decreasing	--
	BEHP	µg/L	unable to calculate - fewer than 4 detected data points						
	Chromium	µg/L	5/9/2013	4/4/2019	13	16	19	--	Decreasing
GW-202S	Ammonia*	mg/L	5/7/2013	4/3/2019	*37*	*49*	*43*	--	No trend
	BEHP	µg/L	unable to calculate - fewer than 4 detected data points						
	Chromium*	µg/L	5/7/2013	4/3/2019	26	*123*	3.7	--	No trend
PZ-16RRR	Ammonia	mg/L	8/21/2013	4/4/2019	*81*	*93*	*90*	Decreasing	--
	Chromium	µg/L	8/21/2013	4/4/2019	10	17	15.2	--	Increasing
PZ-17RRR	Ammonia	mg/L	11/21/2013	4/3/2019	*36*	*38*	*39*	--	Decreasing
	Chromium*	µg/L	11/21/2013	4/3/2019	7.3	10.0	8.0	--	No trend
PZ-18R	Ammonia	mg/L	11/21/2013	3/15/2019	*150*	*200*	*260*	--	Decreasing
	Chromium	µg/L	11/21/2013	3/15/2019	28	34	46.3	--	Increasing

Notes:

Red italics = exceeds surface water screening criteria (chromium = chronic AWQC [74 ug/L],BEHP = EPA R4 chronic ([3 ug/L], Ammonia = chronic AWQC, temp 20, pH7 [7.1 mg/L])

The following wells did not have sufficient data for trend analysis: B-05R, B-10, GW-23, GW-100, GW-102, GW-307, IW-1, IW-2, IW-3, P5

Dark red shading = trend is increasing and statistically significant. Light red shading = trend is increasing and not statistically significant.

Dark blue shading = trend is decreasing and statistically significant. Light blue shading = trend is decreasing and not statistically significant

Yellow shading = no apparent increasing or decreasing trend.

*Dixon's test identified a potential outlier. Outlier retained in evaluation.

**ND above maximum detected value removed

Groundwater Statistics Tool
Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	B-03
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	17
Number of nondetect results:	3
Detection frequency:	0.85

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
8/6/1999	24		Yes
8/10/2000	10		Yes
8/15/2001	7		Yes
8/15/2002	4.91		Yes
8/20/2003	0.29		Yes
8/19/2004	2.7		Yes
8/3/2005	0.76		Yes
11/15/2007	1.5		Yes
11/24/2008	0.64		Yes
11/12/2009	1		Yes
5/10/2010	0.17		Yes
10/11/2010	0.12	U	No
11/18/2010	0.21		Yes
11/9/2011	0.02	U	No
11/14/2012	0.02		Yes
11/5/2014	0.57		Yes
11/5/2015	0.34	J	Yes
12/6/2016	0.3		Yes
11/14/2017	2.6		Yes
11/28/2018	0.27	U	No

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool
Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-13
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	31969.15234
Significant figures to use	2

Number of data points:	20
Number of detected results:	8
Number of nondetect results:	12
Detection frequency:	0.4

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
8/10/2000	0.13		Yes
5/23/2001	0.44		Yes
8/15/2002	0.1	U	No
8/21/2003	0.15		Yes
8/16/2004	0.25		Yes
8/3/2005	0.1	U	No
11/15/2007	0.1	U	No
11/24/2008	0.1	U	No
11/12/2009	0.1	U	No
5/10/2010	0.2		Yes
10/12/2010	0.33	U	No
11/18/2010	0.1	U	No
11/10/2011	0.19		Yes
11/14/2012	0.02	U	No
11/20/2013	0.02	U	No
11/5/2014	0.02	U	No
11/5/2015	0.11	J	Yes
12/6/2016	0.11	J	Yes
11/14/2017	0.24	U	No
11/28/2018	0.21	U	No

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool
Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	9/30/2019
Person performing analysis	J. Lambert

Chemical of Concern	BEHP
Well Name/Number	GW-13
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	3
Source of cleanup level (e.g. MCL or	EPA R4

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	6
Number of nondetect results:	14
Detection frequency:	0.3

Date (Date)	BEHP Concentration (ug/L)	Data Qualifier	Detected? (Yes or No)
8/15/2002	10	U	No
4/3/2003	10	U	No
5/23/2003	20		Yes
8/21/2003	10	U	No
8/16/2004	10	U	No
8/3/2005	10	U	No
11/15/2007	9.9		Yes
11/24/2008	2	U	No
11/12/2009	1.8	U	No
5/10/2010	1.8	U	No
10/12/2010	1.8	U	No
11/18/2010	0.84	UJ	No
11/10/2011	0.89	J	Yes
11/14/2012	2	U	No
11/20/2013	2.1	U	No
11/5/2014	1.9	U	No
11/5/2015	2.2	J	Yes
12/6/2016	5.2	U	No
11/14/2017	0.42	J	Yes
11/28/2018	0.55	J	Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool
Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-14
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	32862.59766
Significant figures to use	2

Number of data points:	15
Number of detected results:	15
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
3/1/1981	4		Yes
4/1/1981	10		Yes
5/1/1981	3		Yes
6/1/1981	7		Yes
8/1/1981	5		Yes
6/26/1986	10		Yes
12/1/1986	25		Yes
6/1/1987	70		Yes
12/1/1987	72		Yes
5/19/1988	0.27		Yes
5/1/1990	0.53		Yes
7/24/1997	24.7		Yes
10/1/1997	96.9		Yes
5/13/2010	0.24		Yes
10/13/2010	13		Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool

Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	9/30/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-16R
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	20
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
3/21/2013	4.5		Yes
5/10/2013	4.8		Yes
8/22/2013	5.2		Yes
11/19/2013	6.65		Yes
4/2/2014	7.1		Yes
5/29/2014	3.9		Yes
8/26/2014	5		Yes
11/5/2014	4.25		Yes
4/14/2015	4.6		Yes
5/27/2015	3.7		Yes
8/19/2015	3.8		Yes
11/6/2015	5.8		Yes
3/22/2016	3.7		Yes
5/25/2016	3.5		Yes
8/24/2016	4		Yes
11/17/2016	4.5	J	Yes
3/30/2017	3.8		Yes
11/15/2017	4.4		Yes
11/28/2018	3.6		Yes
3/12/2019	3.3		Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool
Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-52S
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	7
Number of detected results:	7
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
8/1/1991	65		Yes
8/4/1992	49		Yes
11/3/1992	46		Yes
1/18/2000	13		Yes
5/13/2010	1.3		Yes
10/13/2010	2.9		Yes
3/12/2019	2		Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool
Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-101
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	33565.20313
Significant figures to use	2

Number of data points:	20
Number of detected results:	20
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
8/15/2002	0.52		Yes
8/21/2003	0.78		Yes
9/30/2003	0.19		Yes
8/24/2004	0.52		Yes
8/3/2005	0.48		Yes
11/15/2007	0.92		Yes
11/24/2008	1.3		Yes
11/13/2009	0.63		Yes
5/12/2010	1.9		Yes
10/11/2010	1.7		Yes
11/18/2010	0.95		Yes
11/9/2011	1.2		Yes
11/15/2012	6		Yes
11/20/2013	4.8		Yes
11/5/2014	1.9		Yes
11/5/2015	1.4		Yes
12/6/2016	1.9		Yes
11/14/2017	2.6		Yes
11/28/2018	1.6	J	Yes
3/12/2019	1.5		Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool

Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	BEHP
Well Name/Number	GW-101
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	3
Source of cleanup level (e.g. MCL or	EPA R4

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	13
Number of nondetect results:	7
Detection frequency:	0.65

Date (Date)	BEHP Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
4/3/2003	1700		Yes
5/23/2003	1155		Yes
8/21/2003	10	U	No
9/30/2003	995		Yes
8/24/2004	10	U	No
8/3/2005	230		Yes
11/15/2007	54		Yes
11/24/2008	350		Yes
11/13/2009	23		Yes
5/12/2010	0.82	U	No
10/11/2010	1	J	Yes
11/18/2010	2.7	UJ	No
11/9/2011	2.6		Yes
11/15/2012	1.9	U	No
11/20/2013	1.6	J	Yes
11/5/2014	4.9	U	No
11/5/2015	1.6	J	Yes
12/6/2016	4.9	J	Yes
11/14/2017	2.6	J	Yes
11/28/2018	25	U	No

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool

Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	IW-6
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	34569.65625
Significant figures to use	2

Number of data points:	20
Number of detected results:	19
Number of nondetect results:	1
Detection frequency:	0.95

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
8/6/1999	1		Yes
8/10/2000	1.1		Yes
5/23/2001	0.46		Yes
8/16/2001	0.66		Yes
8/16/2002	0.36		Yes
8/21/2003	0.58		Yes
8/19/2004	1.5		Yes
8/3/2005	0.9		Yes
11/15/2007	1.1		Yes
11/24/2008	0.57		Yes
11/12/2009	0.53		Yes
11/18/2010	0.61		Yes
11/9/2011	0.2		Yes
11/14/2012	0.49		Yes
11/20/2013	0.5		Yes
11/5/2014	0.67	J	Yes
11/5/2015	0.59		Yes
12/6/2016	0.65		Yes
11/14/2017	0.85		Yes
11/27/2018	1.2	U	No

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool
Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	BEHP
Well Name/Number	IW-6
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	3
Source of cleanup level (e.g. MCL or	EPA R4

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	8
Number of nondetect results:	12
Detection frequency:	0.4

Date (Date)			Detected? (Yes or No)
2/13/1998	14		Yes
5/26/1999	9.7	U	No
8/6/1999	9.5	U	No
5/23/2001	10	U	No
8/16/2002	10	U	No
8/21/2003	10	U	No
8/19/2004	10	U	No
8/3/2005	10	U	No
11/15/2007	5.4	U	No
11/24/2008	0.88	J	Yes
11/12/2009	1.8	U	No
11/18/2010	0.88	UJ	No
11/9/2011	0.49	J	Yes
11/14/2012	2	U	No
11/20/2013	2	U	No
11/5/2014	5.5		Yes
11/5/2015	0.6	J	Yes
12/6/2016	0.52	J	Yes
11/14/2017	0.58	J	Yes
11/27/2018	0.64	J	Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool
Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	IW-10
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	20
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
8/6/1999	0.39		Yes
8/10/2000	24		Yes
5/23/2001	32		Yes
8/15/2001	2.8		Yes
8/15/2002	1.5		Yes
8/21/2003	1.07		Yes
8/23/2004	2.5		Yes
8/3/2005	6.8		Yes
11/15/2007	59		Yes
11/24/2008	23		Yes
11/13/2009	29		Yes
11/18/2010	56		Yes
11/9/2011	60		Yes
11/14/2012	68		Yes
11/19/2013	57		Yes
11/5/2014	48		Yes
11/6/2015	66		Yes
12/6/2016	79		Yes
11/14/2017	52		Yes
11/27/2018	37		Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool

Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	BEHP
Well Name/Number	IW-10
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	3
Source of cleanup level (e.g. MCL or	EPA R4

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	7
Number of nondetect results:	13
Detection frequency:	0.35

Date (Date)			Detected? (Yes or No)
8/11/1998	6	U	No
8/6/1999	9.8		Yes
8/10/2000	10	U	No
5/23/2001	11		Yes
8/16/2001	10	U	No
8/16/2002	10	U	No
8/21/2003	10	U	No
8/19/2004	10	U	No
8/3/2005	10	U	No
11/15/2007	0.73	U	No
11/24/2008	2	U	No
11/12/2009	0.83	J	Yes
11/18/2010	1.6	UJ	No
11/9/2011	0.91	J	Yes
11/14/2012	2	U	No
11/20/2013	2.1	U	No
11/5/2014	1.9	U	No
11/5/2015	0.44	J	Yes
12/6/2016	0.96	J	Yes
11/14/2017	1.6	J	Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool
Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	IW-11
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	36028.05469
Significant figures to use	2

Number of data points:	20
Number of detected results:	20
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
11/21/1990	12		Yes
11/27/1990	8.4		Yes
11/28/1990	9.3		Yes
12/17/1991	100		Yes
11/10/1992	11		Yes
1/24/1997	4.99		Yes
3/16/2005	9.6		Yes
4/19/2005	15		Yes
5/18/2005	9.2		Yes
6/15/2005	9.8		Yes
8/17/2005	5.4		Yes
9/21/2005	4.7		Yes
10/19/2005	4.6		Yes
11/16/2005	5		Yes
12/21/2005	7.3		Yes
1/18/2006	10		Yes
2/17/2006	9.2		Yes
3/15/2006	6.2		Yes
4/20/2006	4.9		Yes
5/10/2006	4		Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool
Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	9/30/2019
Person performing analysis	J. Lambert

Chemical of Concern	BEHP
Well Name/Number	IW-11
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	3
Source of cleanup level (e.g. MCL or	EPA R4

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	37452.30859
Significant figures to use	2

Number of data points:	11
Number of detected results:	9
Number of nondetect results:	2
Detection frequency:	0.818181818

Date (Date)	BEHP Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
5/19/1988	270		Yes
12/8/1988	390		Yes
5/1/1989	120		Yes
11/1/1989	50	U	No
5/1/1990	10	U	No
11/21/1990	710000		Yes
12/17/1991	1300000		Yes
8/12/1992	190000	J	Yes
11/10/1992	5500000	B	Yes
12/18/1996	30	JB	Yes
9/6/2013	8.7		Yes

Data Review			Recommendations
Are all necessary data fields entered, and in proper format?		Yes	None
Are at least 4 data points present for statistical analysis?		Yes	None
Are detection limits for nondetects ≤ maximum detected value		Yes	None
Are all data within chart axis limits?		Yes	None

Groundwater Statistics Tool
Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-3S
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	19
Number of nondetect results:	1
Detection frequency:	0.95

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
3/15/1978	340		Yes
4/10/1978	195		Yes
3/1/1981	46		Yes
4/1/1981	75		Yes
5/1/1981	29		Yes
6/1/1981	48		Yes
8/1/1981	36		Yes
6/27/1986	10.45		Yes
12/1/1986	12		Yes
6/1/1987	7.2		Yes
12/1/1987	12		Yes
5/19/1988	6.3		Yes
5/1/1989	4.9		Yes
5/1/1990	5.5		Yes
8/1/1991	8.2		Yes
11/5/1992	13		Yes
1/20/2000	1.7		Yes
5/17/2010	0.61		Yes
10/15/2010	7.2		Yes
3/13/2019	0.4	U	No

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool

Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-4
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	20
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
10/1/1982	182		Yes
6/1/1983	260		Yes
10/1/1983	100		Yes
7/1/1984	100		Yes
12/1/1984	66		Yes
6/27/1986	84		Yes
12/1/1986	71		Yes
6/1/1987	56		Yes
12/1/1987	980		Yes
5/19/1988	41		Yes
12/8/1988	64		Yes
5/1/1989	25		Yes
11/1/1989	49		Yes
5/1/1990	47		Yes
8/1/1991	31		Yes
8/5/1992	48		Yes
11/5/1992	36		Yes
5/18/2010	19		Yes
10/14/2010	42		Yes
3/19/2019	7.7		Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool
Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-17S
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	39263.90234
Significant figures to use	2

Number of data points:	17
Number of detected results:	16
Number of nondetect results:	1
Detection frequency:	0.941176471

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
4/1/1981	46		Yes
5/1/1981	48		Yes
6/1/1981	45		Yes
8/1/1981	56		Yes
7/24/1986	16		Yes
12/1/1986	1	U	No
12/1/1987	4.8		Yes
5/19/1988	8.8		Yes
5/1/1989	51		Yes
5/1/1990	8.3		Yes
8/1/1991	15		Yes
11/3/1992	1.3		Yes
1/28/2000	43		Yes
3/17/2004	31		Yes
5/19/2010	47		Yes
10/19/2010	35		Yes
3/21/2019	17		Yes

Data Review			Recommendations
Are all necessary data fields entered, and in proper format?		Yes	None
Are at least 4 data points present for statistical analysis?		Yes	None
Are detection limits for nondetects ≤ maximum detected value		Yes	None
Are all data within chart axis limits?		Yes	None

Groundwater Statistics Tool
Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-51S
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	6
Number of detected results:	6
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
8/1/1991	24		Yes
8/5/1992	17		Yes
11/3/1992	14		Yes
1/20/2000	5		Yes
5/18/2010	0.885		Yes
10/18/2010	4		Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool
Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-55S
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	20
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
2/26/2002	320		Yes
5/23/2002	244		Yes
8/13/2002	0.1		Yes
11/5/2002	160		Yes
5/15/2003	198		Yes
8/14/2003	180		Yes
12/1/2003	348		Yes
5/21/2004	290		Yes
8/24/2004	360		Yes
11/9/2004	290		Yes
5/20/2005	170	J	Yes
8/2/2005	330	J	Yes
11/17/2005	220		Yes
11/13/2007	190		Yes
5/23/2008	260		Yes
11/20/2008	270		Yes
5/14/2009	15		Yes
5/18/2010	150		Yes
10/14/2010	180		Yes
3/18/2019	140		Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool

Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Chromium
Well Name/Number	GW-55S
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	74
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	46112.95703
Significant figures to use	2

Number of data points:	20
Number of detected results:	7
Number of nondetect results:	13
Detection frequency:	0.35

Date (Date)	Chromium Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
8/15/2002	10	U	Yes
8/21/2003	5	U	Yes
9/30/2003	5		Yes
8/24/2004	13		Yes
8/3/2005	5	U	Yes
11/15/2007	5	U	Yes
11/24/2008	10	U	Yes
11/13/2009	5	U	Yes
5/12/2010	10	U	Yes
10/11/2010	10	U	Yes
11/18/2010	10	U	Yes
11/9/2011	10	U	Yes
11/15/2012	10	U	Yes
11/20/2013	5.9		Yes
11/5/2014	2.4	J	Yes
11/5/2015	1.9	J	Yes
12/6/2016	1.8	J	Yes
11/14/2017	1.6	U	Yes
11/28/2018	4.2	U	Yes
3/12/2019	1.3	J	Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool
Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-78S
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	20
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
5/9/2013	43		Yes
8/21/2013	47		Yes
11/19/2013	44		Yes
4/1/2014	43	J	Yes
5/22/2014	38		Yes
8/19/2014	30		Yes
11/3/2014	43		Yes
4/8/2015	35		Yes
5/19/2015	31		Yes
8/18/2015	52		Yes
11/4/2015	37		Yes
3/16/2016	32		Yes
5/18/2016	38		Yes
8/23/2016	36		Yes
11/14/2016	37		Yes
3/29/2017	27		Yes
10/31/2017	33		Yes
8/6/2018	35		Yes
3/18/2019	27		Yes
4/3/2019	24		Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool

Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Chromium
Well Name/Number	GW-78S
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	74
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	47895.62109
Significant figures to use	2

Number of data points:	20
Number of detected results:	20
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Chromium Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
5/9/2013	2.9	J	Yes
8/21/2013	24	J	Yes
11/19/2013	3	J	Yes
4/1/2014	1.5	J	Yes
5/22/2014	3.3	J	Yes
8/19/2014	3.5	J	Yes
11/3/2014	3.6	J	Yes
4/8/2015	2.3	J	Yes
5/19/2015	2.6	J	Yes
8/18/2015	2.5	J	Yes
11/4/2015	4.5	J	Yes
3/16/2016	2.7	J	Yes
5/18/2016	3.6	J	Yes
8/23/2016	2.9	J	Yes
11/14/2016	3.7	J	Yes
3/29/2017	2	J	Yes
10/31/2017	2	J	Yes
8/6/2018	3	J	Yes
3/18/2019	5.1	J	Yes
4/3/2019	4.8	J	Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool
Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-79S
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	20
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
5/9/2013	120		Yes
8/21/2013	48		Yes
11/19/2013	140		Yes
4/4/2014	92	J	Yes
5/22/2014	98		Yes
8/20/2014	27		Yes
11/4/2014	63		Yes
4/8/2015	87		Yes
5/19/2015	73		Yes
8/18/2015	83		Yes
11/4/2015	39		Yes
3/16/2016	78		Yes
5/18/2016	70		Yes
8/23/2016	80		Yes
11/14/2016	51		Yes
4/3/2017	57		Yes
11/9/2017	85		Yes
8/6/2018	72		Yes
3/15/2019	36		Yes
4/4/2019	61		Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool

Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Chromium
Well Name/Number	GW-79S
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	74
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	20
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Chromium Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
5/9/2013	7.4		Yes
8/21/2013	24		Yes
11/19/2013	25		Yes
4/4/2014	6.7		Yes
5/22/2014	4.6	J	Yes
8/20/2014	3.8	J	Yes
11/4/2014	23		Yes
4/8/2015	6.1		Yes
5/19/2015	7.1		Yes
8/18/2015	14		Yes
11/4/2015	27		Yes
3/16/2016	16		Yes
5/18/2016	6.3		Yes
8/23/2016	14		Yes
11/14/2016	21		Yes
4/3/2017	4.4	J	Yes
11/9/2017	14		Yes
8/7/2018	12		Yes
3/15/2019	12		Yes
4/4/2019	4	J	Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool
Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	9/30/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-202S
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	50063.88281
Significant figures to use	2

Number of data points:	20
Number of detected results:	20
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
5/7/2013	53		Yes
8/21/2013	47		Yes
11/18/2013	49		Yes
4/1/2014	28		Yes
5/20/2014	30	J	Yes
8/19/2014	30		Yes
11/3/2014	27		Yes
4/6/2015	29		Yes
5/18/2015	29		Yes
8/18/2015	46		Yes
11/2/2015	33		Yes
3/16/2016	29		Yes
5/17/2016	31		Yes
8/22/2016	42		Yes
11/10/2016	35		Yes
3/29/2017	26		Yes
10/31/2017	39		Yes
8/6/2018	76		Yes
3/15/2019	34		Yes
4/3/2019	31		Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool

Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Chromium
Well Name/Number	GW-202S
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	74
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	50465.32031
Significant figures to use	2

Number of data points:	20
Number of detected results:	20
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Chromium Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
5/7/2013	3.9	J	Yes
8/21/2013	4	J	Yes
11/18/2013	3.9	J	Yes
4/1/2014	2.6	J	Yes
5/20/2014	3.6	J	Yes
8/19/2014	450		Yes
11/3/2014	4.8	J	Yes
4/6/2015	2.9	J	Yes
5/18/2015	3.3	J	Yes
8/18/2015	2.9	J	Yes
11/2/2015	2.4	J	Yes
3/16/2016	2.9	J	Yes
5/17/2016	3.4	J	Yes
8/22/2016	3	J	Yes
11/10/2016	2.3	J	Yes
3/29/2017	2.7	J	Yes
10/31/2017	2.3	J	Yes
8/6/2018	3.1	J	Yes
3/15/2019	4.1	J	Yes
4/3/2019	3.8	J	Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool

Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	9/30/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	PZ-16RRR
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	20
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
8/21/2013	100		Yes
11/21/2013	150		Yes
4/4/2014	34	J	Yes
5/22/2014	93		Yes
8/20/2014	90		Yes
11/4/2014	95		Yes
4/8/2015	90		Yes
5/19/2015	94		Yes
8/18/2015	100		Yes
11/4/2015	110		Yes
5/23/2016	67		Yes
8/23/2016	67		Yes
11/14/2016	53		Yes
4/3/2017	99		Yes
11/9/2017	36		Yes
4/13/2018	36		Yes
5/16/2018	83		Yes
8/7/2018	37		Yes
11/14/2018	100		Yes
4/4/2019	90		Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool

Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Chromium
Well Name/Number	PZ-16RRR
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	74
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	53761.55078
Significant figures to use	2

Number of data points:	20
Number of detected results:	20
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Chromium Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
8/21/2013	4	J	Yes
11/21/2013	4	J	Yes
4/4/2014	27		Yes
5/22/2014	7.3		Yes
8/20/2014	5.2		Yes
11/4/2014	5		Yes
4/8/2015	6.1		Yes
5/19/2015	7.9		Yes
8/18/2015	4.1	J	Yes
11/4/2015	3.9	J	Yes
5/23/2016	16		Yes
8/23/2016	27		Yes
11/14/2016	16		Yes
4/3/2017	8.5		Yes
11/9/2017	16		Yes
4/13/2018	6.8		Yes
5/16/2018	6.5		Yes
8/7/2018	14		Yes
11/14/2018	9		Yes
4/4/2019	7.1		Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool
Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	9/30/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	PZ-17RRR
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	20
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
11/21/2013	45		Yes
4/4/2014	41		Yes
5/22/2014	33	J	Yes
8/21/2014	35		Yes
11/4/2014	34		Yes
4/8/2015	46		Yes
5/19/2015	28		Yes
8/18/2015	35		Yes
11/4/2015	47		Yes
3/16/2016	32		Yes
5/18/2016	36		Yes
8/24/2016	33		Yes
11/14/2016	39		Yes
4/3/2017	31		Yes
11/9/2017	34		Yes
4/13/2018	38		Yes
5/16/2018	36		Yes
8/7/2018	42		Yes
11/14/2018	30		Yes
4/3/2019	28		Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool

Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Chromium
Well Name/Number	PZ-17RRR
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	74
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	54720.39063
Significant figures to use	2

Number of data points:	20
Number of detected results:	20
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Chromium Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
11/21/2013	5.2		Yes
4/4/2014	10		Yes
5/22/2014	5.7		Yes
8/21/2014	6.5		Yes
11/4/2014	6.5		Yes
4/8/2015	5.6		Yes
5/19/2015	5.4		Yes
8/18/2015	6.6		Yes
11/4/2015	18		Yes
3/16/2016	6.4		Yes
5/18/2016	10		Yes
8/24/2016	6.2		Yes
11/14/2016	6.3		Yes
4/3/2017	7.2		Yes
10/31/2017	5.1		Yes
4/13/2018	6.6		Yes
5/16/2018	6.7		Yes
8/7/2018	8.6		Yes
11/14/2018	6.3		Yes
4/3/2019	7.5		Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool

Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	9/30/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	PZ-18R
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	20
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
11/21/2013	35		Yes
4/1/2014	120	J	Yes
5/21/2014	400		Yes
8/20/2014	71		Yes
11/4/2014	38		Yes
4/7/2015	360		Yes
6/3/2015	300		Yes
8/18/2015	80		Yes
11/4/2015	41		Yes
3/16/2016	150		Yes
5/18/2016	270		Yes
8/24/2016	44		Yes
11/10/2016	13		Yes
4/3/2017	130		Yes
11/9/2017	36		Yes
4/11/2018	200		Yes
5/16/2018	190		Yes
8/7/2018	33		Yes
11/15/2018	160		Yes
3/15/2019	250		Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool

Data input worksheet

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Chromium
Well Name/Number	PZ-17RRR
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	74
Source of cleanup level (e.g. MCL or	AWQC

Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	54720.39063
Significant figures to use	2

Number of data points:	20
Number of detected results:	20
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Chromium Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
11/21/2013	13		Yes
4/1/2014	18		Yes
5/21/2014	58		Yes
8/20/2014	24		Yes
11/4/2014	13		Yes
4/7/2015	36		Yes
6/3/2015	41		Yes
8/18/2015	25		Yes
11/4/2015	17		Yes
3/16/2016	28		Yes
5/18/2016	51		Yes
8/24/2016	21		Yes
11/10/2016	7.1		Yes
4/3/2017	21		Yes
11/9/2017	9.8		Yes
4/11/2018	36		Yes
5/16/2018	45		Yes
8/7/2018	11		Yes
11/15/2018	32		Yes
3/15/2019	50		Yes

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool

Data input worksheet

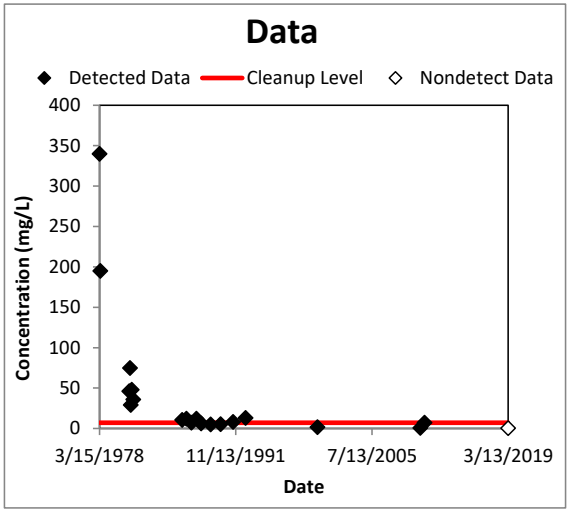
Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-3S
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or risk-based concentration)	AWQC
Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	19
Number of nondetect results:	1
Detection frequency:	0.95

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
3/15/1978	340		Yes
4/10/1978	195		Yes
3/1/1981	46		Yes
4/1/1981	75		Yes
5/1/1981	29		Yes
6/1/1981	48		Yes
8/1/1981	36		Yes
6/27/1986	10.45		Yes
12/1/1986	12		Yes
6/1/1987	7.2		Yes
12/1/1987	12		Yes
5/19/1988	6.3		Yes
5/1/1989	4.9		Yes
5/1/1990	5.5		Yes
8/1/1991	8.2		Yes
11/5/1992	13		Yes
1/20/2000	1.7		Yes
5/17/2010	0.61		Yes
10/15/2010	7.2		Yes
3/13/2019	0.4	U	No



Axis Values			
Time		Concentration	
Min	Max	Min	Max
Auto	Auto	Auto	Auto

Reset Concentration Axis

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value?	Yes	None
Are all data within chart axis limits?	Yes	None

Groundwater Statistics Tool

Data input worksheet

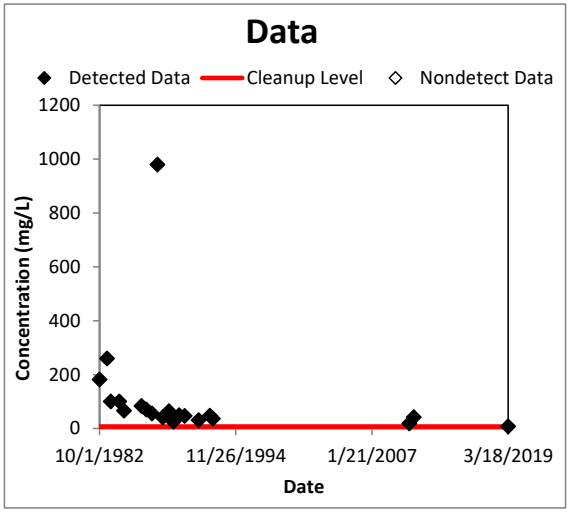
Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-4
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or risk-based concentration)	AWQC
Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	20
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
10/1/1982	182		Yes
6/1/1983	260		Yes
10/1/1983	100		Yes
7/1/1984	100		Yes
12/1/1984	66		Yes
6/27/1986	84		Yes
12/1/1986	71		Yes
6/1/1987	56		Yes
12/1/1987	980		Yes
5/19/1988	41		Yes
12/8/1988	64		Yes
5/1/1989	25		Yes
11/1/1989	49		Yes
5/1/1990	47		Yes
8/1/1991	31		Yes
8/5/1992	48		Yes
11/5/1992	36		Yes
5/18/2010	19		Yes
10/14/2010	42		Yes
3/19/2019	7.7		Yes



Axis Values			
Time		Concentration	
Min	Max	Min	Max
Auto	Auto	Auto	Auto

Reset Concentration Axis

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value?	Yes	None
Are all data within chart axis limits?	Yes	None

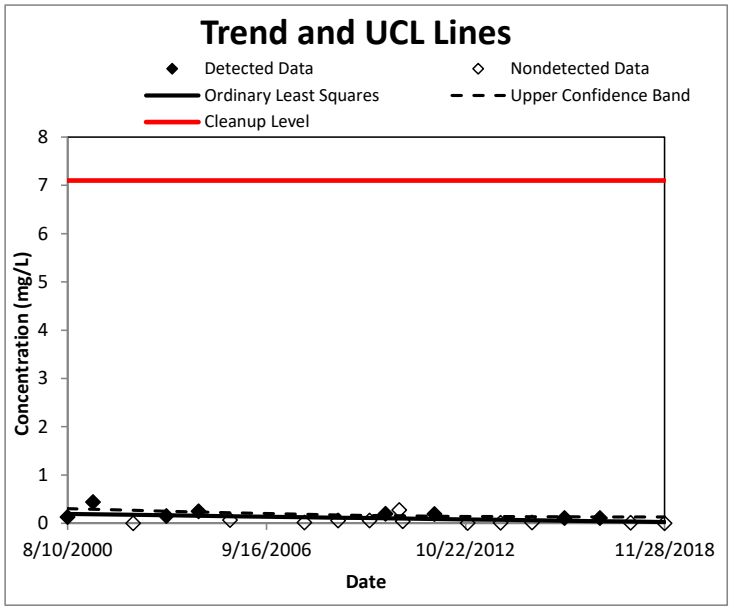
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets with nondetects

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-13
Date Units	Date
Concentration Units	mg/L

Confidence Level	95%
Number of results	20
Number of detected results	8
Number of non-detected results	12
Detection frequency	40%
Number at or below cleanup level	20
Are any potential outliers present?	No
Mean of concentration	0.099
Standard deviation of concentration	0.11



95% Upper Confidence Limit (UCL)	0.22
Method for calculating UCL	KM Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	0.131
Trend calculation method	Ordinary Least Squares
Cleanup level	7.1
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

Data, including imputed values

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Imputed value*
36748	0.13		0.13
37034	0.44		0.44
37483	0.1	U	0
37854	0.15		0.15
38215	0.25		0.25
38567	0.1	U	0.068
39401	0.1	U	0.015
39776	0.1	U	0.059
40129	0.1	U	0.057
40308	0.2		0.2
40463	0.33	U	0.273
40500	0.1	U	0.043
40857	0.19		0.19
41227	0.02	U	0.005
41598	0.02	U	0.01
41948	0.02	U	0.016
42313	0.11	J	0.11
42710	0.11	J	0.11
43053	0.24	U	0.012
43432	0.21	U	0.003

* Note that the imputed value column also includes the actual value for detected samples. This is for convenience in copying and pasting the data.

Random Seed Used	31969.15234

Groundwater Statistics Tool

Data input worksheet

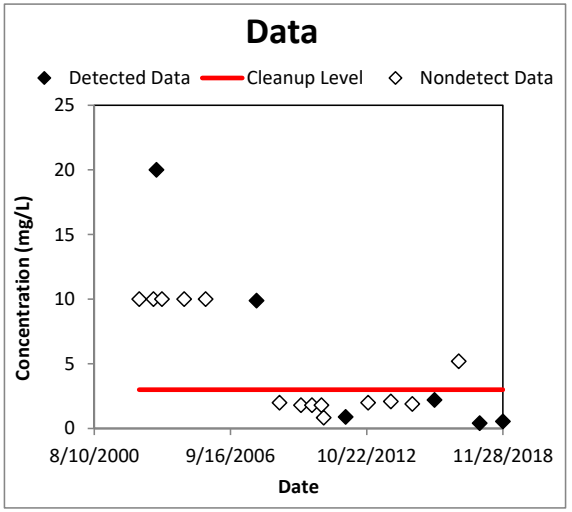
Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	BEHP
Well Name/Number	GW-13
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	3
Source of cleanup level (e.g. MCL or risk-based concentration)	EPA R4
Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	6
Number of nondetect results:	14
Detection frequency:	0.3

Date (Date)	BEHP Concentration (ug/L)	Data Qualifier	Detected? (Yes or No)
8/15/2002	10	U	No
4/3/2003	10	U	No
5/23/2003	20		Yes
8/21/2003	10	U	No
8/16/2004	10	U	No
8/3/2005	10	U	No
11/15/2007	9.9		Yes
11/24/2008	2	U	No
11/12/2009	1.8	U	No
5/10/2010	1.8	U	No
10/12/2010	1.8	U	No
11/18/2010	0.84	UJ	No
11/10/2011	0.89	J	Yes
11/14/2012	2	U	No
11/20/2013	2.1	U	No
11/5/2014	1.9	U	No
11/5/2015	2.2	J	Yes
12/6/2016	5.2	U	No
11/14/2017	0.42	J	Yes
11/28/2018	0.55	J	Yes



Axis Values			
Time		Concentration	
Min	Max	Min	Max
Auto	Auto	Auto	Auto

Reset Concentration Axis

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value?	Yes	None
Are all data within chart axis limits?	Yes	None

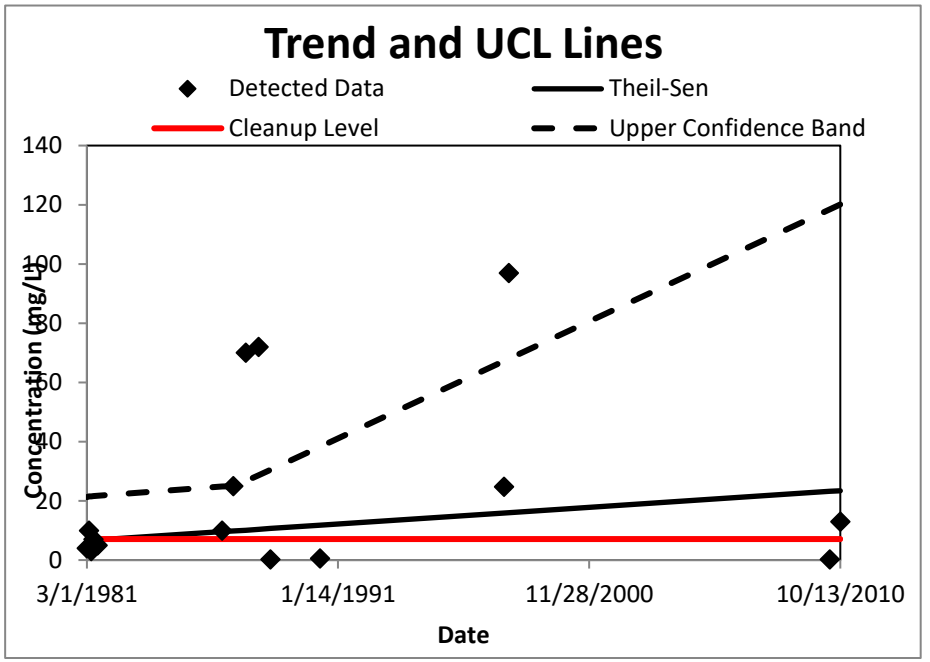
Groundwater Statistics Tool

UCL calculations and summary statistics for nonparametric data sets

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-14
Date Units	Date
Concentration Units	mg/L

Confidence Level	95%
Number of results	15
Number < cleanup level	7
Are any potential outliers present?	No
Mean of concentration	23
Standard deviation of concentration	31



95% Upper Confidence Limit (UCL)	58
Method for calculating UCL	Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	120
Trend calculation method	Theil-Sen/Mann-Kendall
Cleanup level	7.1
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Random Seed Used	32862.59766
Message: None.	

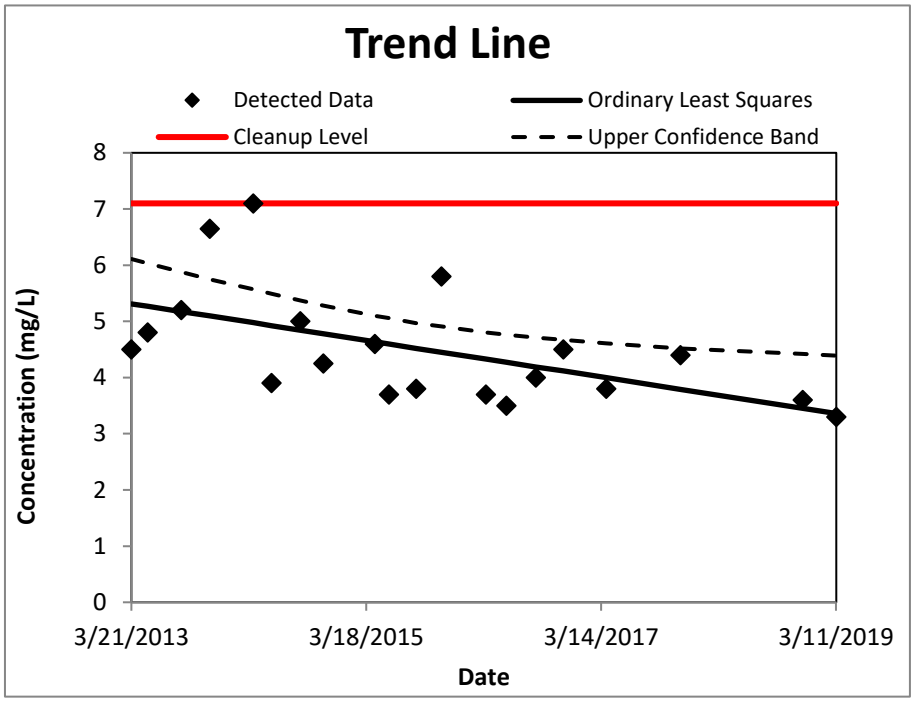
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets that are normally distributed

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-16R
Date Units	Date
Concentration Units	mg/L

Confidence Level	95%
Number of results	20
Number < cleanup level	19
Are any potential outliers present?	No
Mean of concentration	4.5
Standard deviation of concentration	1
t-value for UCL calculation	1.729



95% Upper Confidence Limit (UCL)	4.9
Method for calculating UCL	Student's t UCL
Value of 95% Upper Confidence Band value at final sampling event	4.39
Trend calculation method	Ordinary Least Squares
Cleanup level	7.1
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

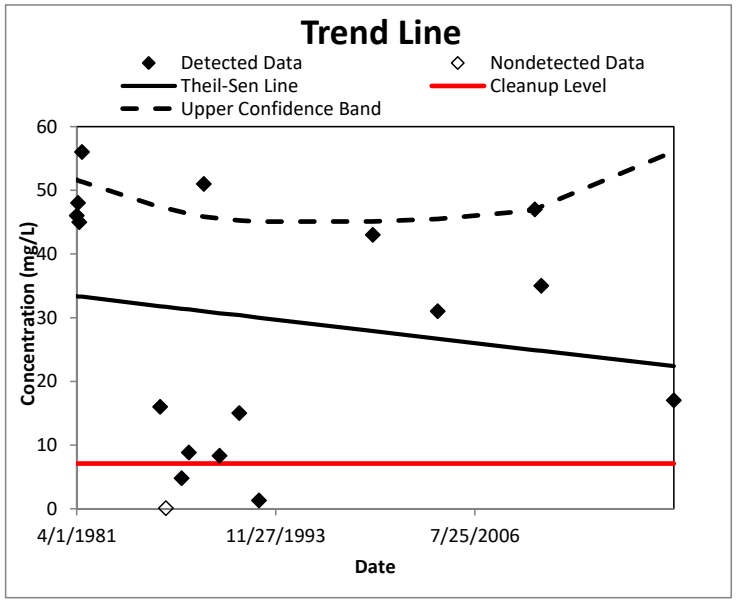
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets with nondetects

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-17S
Date Units	Date
Concentration Units	mg/L

Confidence Level	95%
Number of results	17
Number of detected results	16
Number of non-detected results	1
Detection frequency	94%
Number at or below cleanup level	3
Are any potential outliers present?	No
Mean of concentration	28
Standard deviation of concentration	19



95% Upper Confidence Limit (UCL)	49
Method for calculating UCL	KM Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	56.1
Trend calculation method	Theil-Sen/Mann-Kendall
Cleanup level	7.1
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

Data, including imputed values

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Imputed value*
29677	46		46
29707	48		48
29738	45		45
29799	56		56
31617	16		16
31747	1	U	0.091
32112	4.8		4.8
32282	8.8		8.8
32629	51		51
32994	8.3		8.3
33451	15		15
33911	1.3		1.3
36553	43		43
38063	31		31
40317	47		47
40470	35		35
43545	17		17

* Note that the imputed value column also includes the actual value for detected samples. This is for convenience in copying and pasting the data.

Random Seed Used	39263.90234

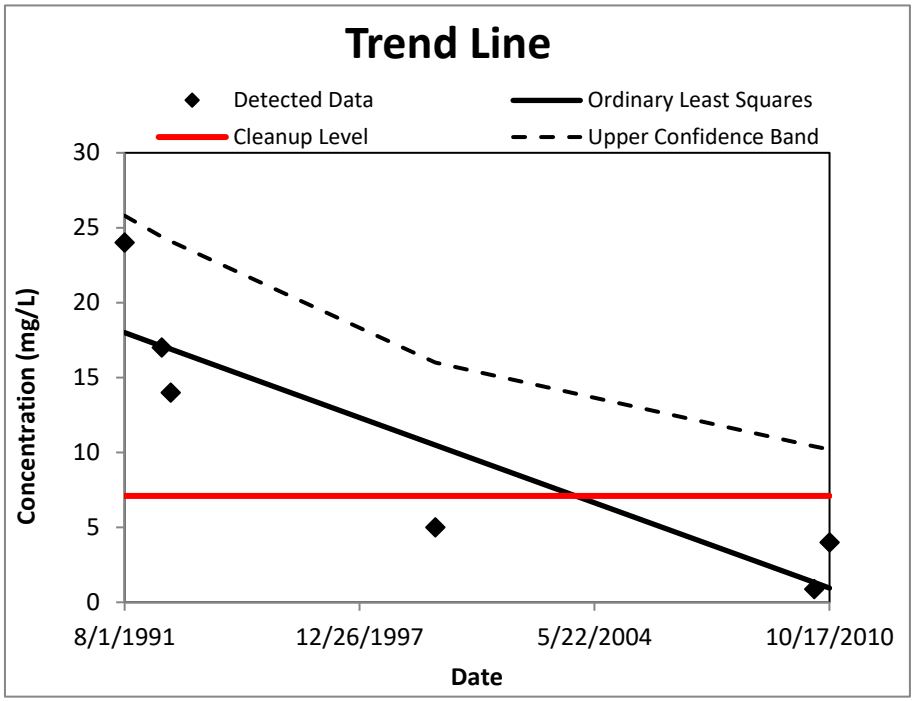
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets that are normally distributed

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-51S
Date Units	Date
Concentration Units	mg/L

Confidence Level	95%
Number of results	6
Number < cleanup level	3
Are any potential outliers present?	No
Mean of concentration	11
Standard deviation of concentration	9
t-value for UCL calculation	2.015



95% Upper Confidence Limit (UCL)	18
Method for calculating UCL	Student's t UCL
Value of 95% Upper Confidence Band value at final sampling event	10.2
Trend calculation method	Ordinary Least Squares
Cleanup level	7.1
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

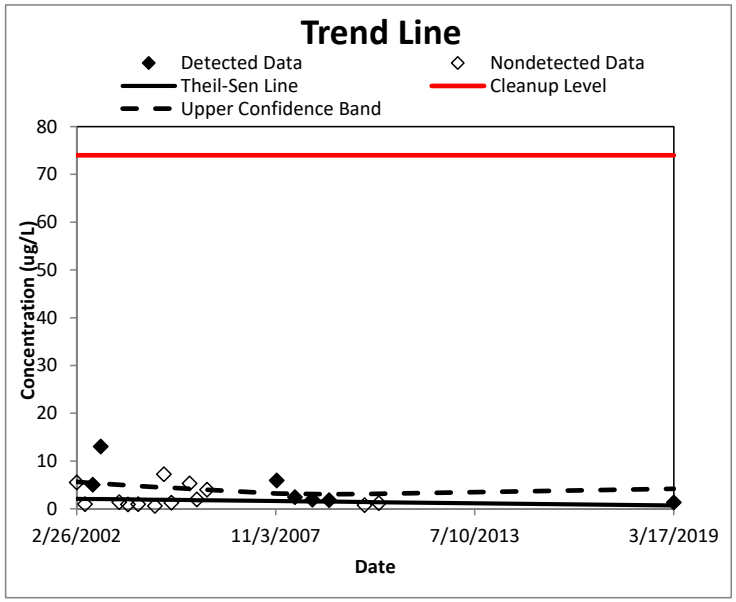
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets with nondetects

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Chromium
Well Name/Number	GW-55S
Date Units	Date
Concentration Units	ug/L

Confidence Level	95%
Number of results	20
Number of detected results	7
Number of non-detected results	13
Detection frequency	35%
Number at or below cleanup level	20
Are any potential outliers present?	Yes
Mean of concentration	2.9
Standard deviation of concentration	2.7



95% Upper Confidence Limit (UCL)	6.1
Method for calculating UCL	KM Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	4.16
Trend calculation method	Theil-Sen/Mann-Kendall
Cleanup level	74
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

Data, including imputed values

Date (Date)	Chromium Concentration (ug/L)	Data Qualifier	Imputed value*
37313	10	U	5.47
37399	5	U	0.957
37481	5		5
37565	13		13
37756	5	U	1.381
37847	5	U	0.899
37956	10	U	0.957
38128	5	U	0.552
38223	10	U	7.215
38300	10	U	1.276
38492	10	U	5.26
38566	10	U	1.908
38673	10	U	3.954
39399	5.9		5.9
39591	2.4	J	2.4
39772	1.9	J	1.9
39947	1.8	J	1.8
40316	1.6	U	0.735
40465	4.2	U	1.127
43542	1.3	J	1.3

* Note that the imputed value column also includes the actual value for detected samples. This is for convenience in copying and pasting the data.

Random Seed Used	46112.95703

Groundwater Statistics Tool

Data input worksheet

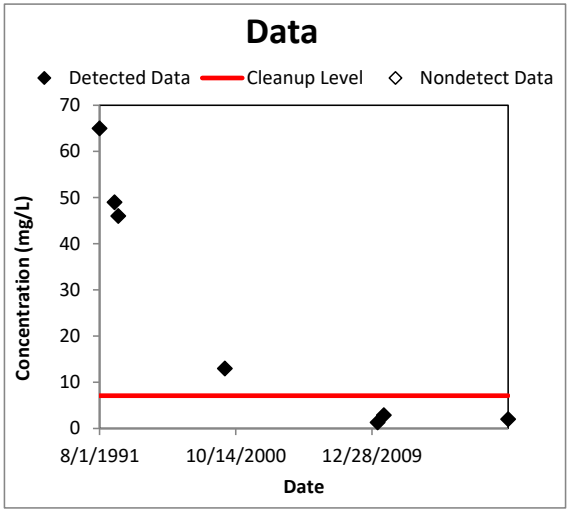
Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-52S
Date Units	Date
Concentration Units	mg/L

Confidence Level Desired	95%
Cleanup Level	7.1
Source of cleanup level (e.g. MCL or risk-based concentration)	AWQC
Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	7
Number of detected results:	7
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Detected? (Yes or No)
8/1/1991	65		Yes
8/4/1992	49		Yes
11/3/1992	46		Yes
1/18/2000	13		Yes
5/13/2010	1.3		Yes
10/13/2010	2.9		Yes
3/12/2019	2		Yes



Axis Values			
Time		Concentration	
Min	Max	Min	Max
Auto	Auto	Auto	Auto

Reset Concentration Axis

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value?	Yes	None
Are all data within chart axis limits?	Yes	None

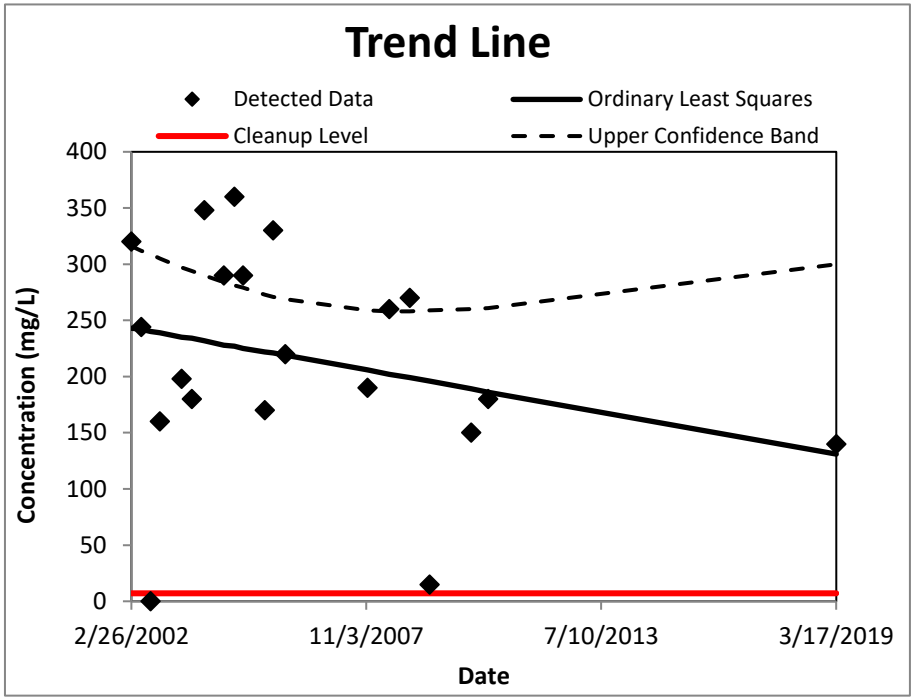
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets that are normally distributed

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-55S
Date Units	Date
Concentration Units	mg/L

Confidence Level	95%
Number of results	20
Number < cleanup level	1
Are any potential outliers present?	No
Mean of concentration	220
Standard deviation of concentration	99
t-value for UCL calculation	1.729



95% Upper Confidence Limit (UCL)	260
Method for calculating UCL	Student's t UCL
Value of 95% Upper Confidence Band value at final sampling event	300
Trend calculation method	Ordinary Least Squares
Cleanup level	7.1
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

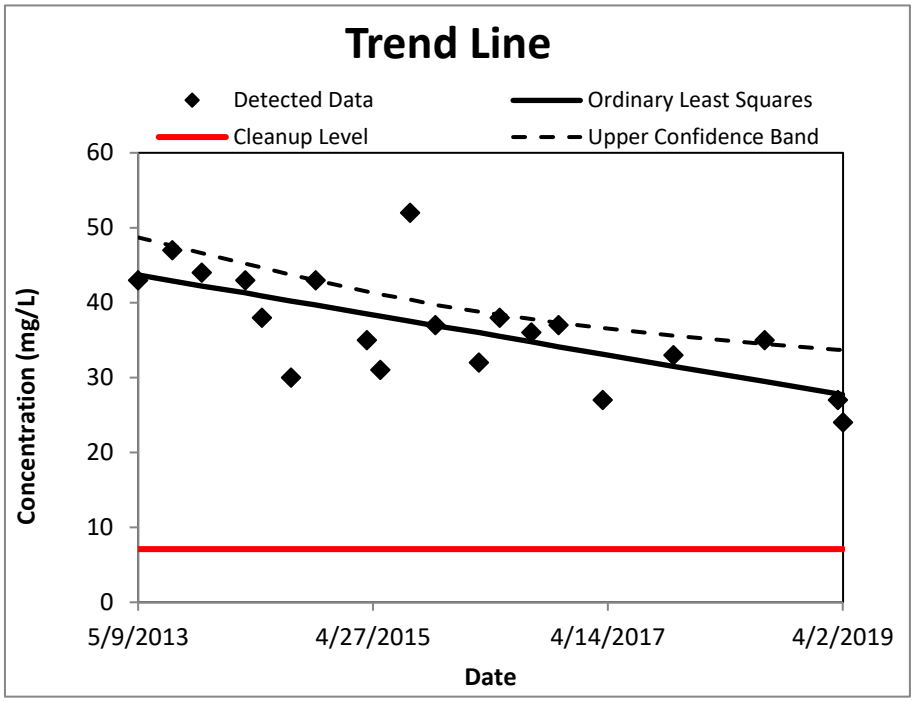
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets that are normally distributed

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-78S
Date Units	Date
Concentration Units	mg/L

Confidence Level	95%
Number of results	20
Number < cleanup level	0
Are any potential outliers present?	No
Mean of concentration	37
Standard deviation of concentration	7.2
t-value for UCL calculation	1.729



95% Upper Confidence Limit (UCL)	40
Method for calculating UCL	Student's t UCL
Value of 95% Upper Confidence Band value at final sampling event	33.7
Trend calculation method	Ordinary Least Squares
Cleanup level	7.1
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

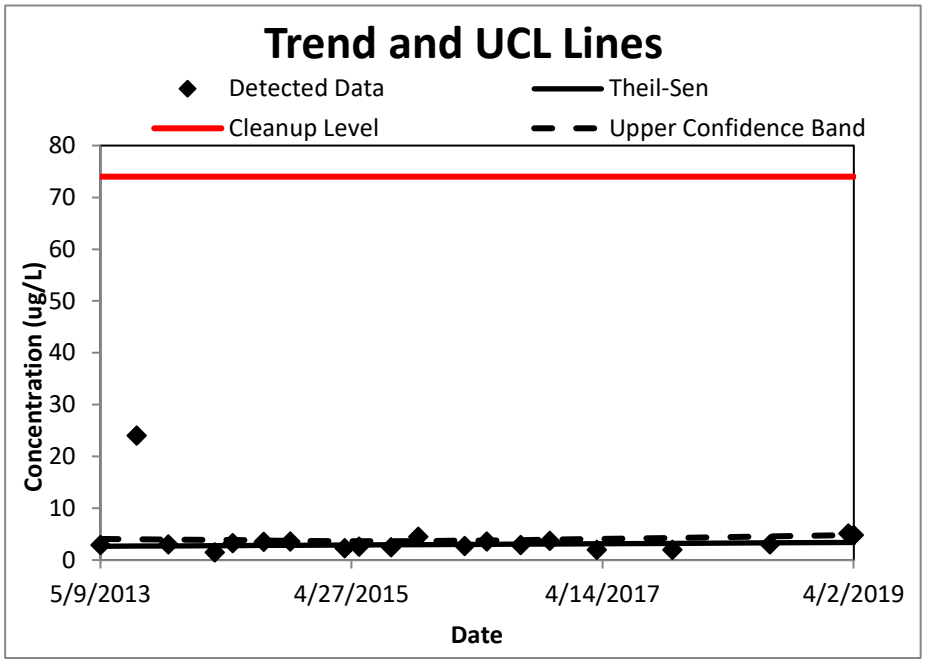
Groundwater Statistics Tool

UCL calculations and summary statistics for nonparametric data sets

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Chromium
Well Name/Number	GW-78S
Date Units	Date
Concentration Units	ug/L

Confidence Level	95%
Number of results	20
Number < cleanup level	20
Are any potential outliers present?	Yes
Mean of concentration	4.2
Standard deviation of concentration	4.8



95% Upper Confidence Limit (UCL)	8.9
Method for calculating UCL	Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	4.85
Trend calculation method	Theil-Sen/Mann-Kendall
Cleanup level	74
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Random Seed Used	47895.62109
Message: None.	

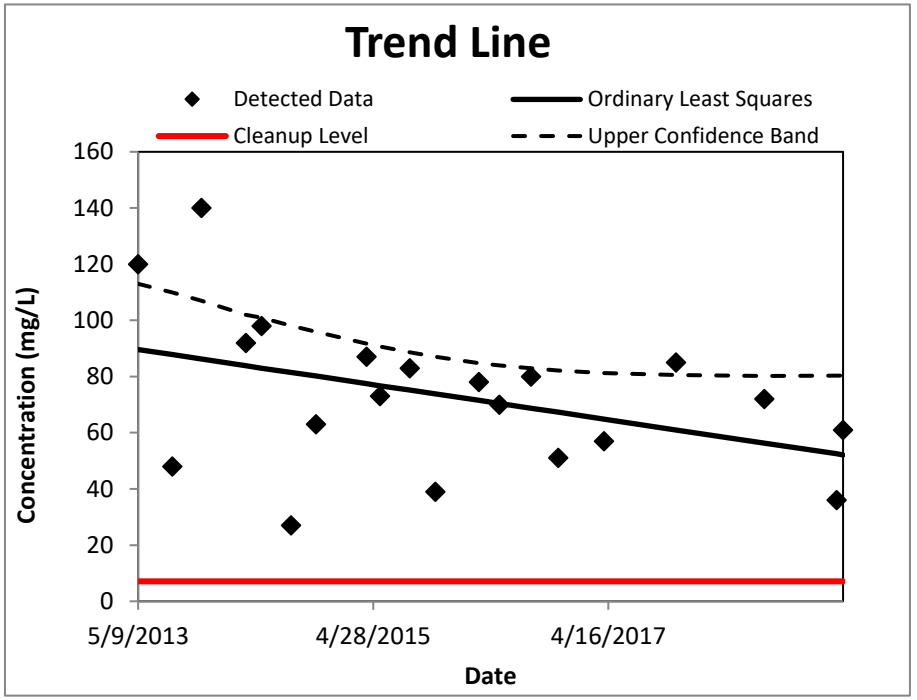
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets that are normally distributed

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-79S
Date Units	Date
Concentration Units	mg/L

Confidence Level	95%
Number of results	20
Number < cleanup level	0
Are any potential outliers present?	No
Mean of concentration	73
Standard deviation of concentration	28
t-value for UCL calculation	1.729



95% Upper Confidence Limit (UCL)	84
Method for calculating UCL	Student's t UCL
Value of 95% Upper Confidence Band value at final sampling event	80.3
Trend calculation method	Ordinary Least Squares
Cleanup level	7.1
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

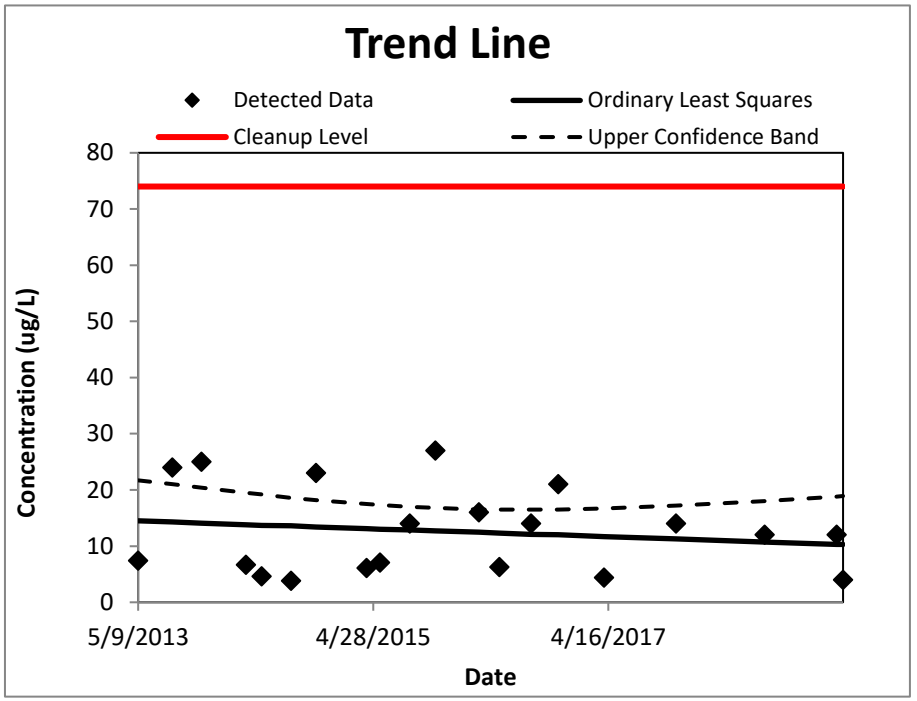
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets that are normally distributed

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Chromium
Well Name/Number	GW-79S
Date Units	Date
Concentration Units	ug/L

Confidence Level	95%
Number of results	20
Number < cleanup level	20
Are any potential outliers present?	No
Mean of concentration	13
Standard deviation of concentration	7.8
t-value for UCL calculation	1.729



95% Upper Confidence Limit (UCL)	16
Method for calculating UCL	Student's t UCL
Value of 95% Upper Confidence Band value at final sampling event	18.9
Trend calculation method	Ordinary Least Squares
Cleanup level	74
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

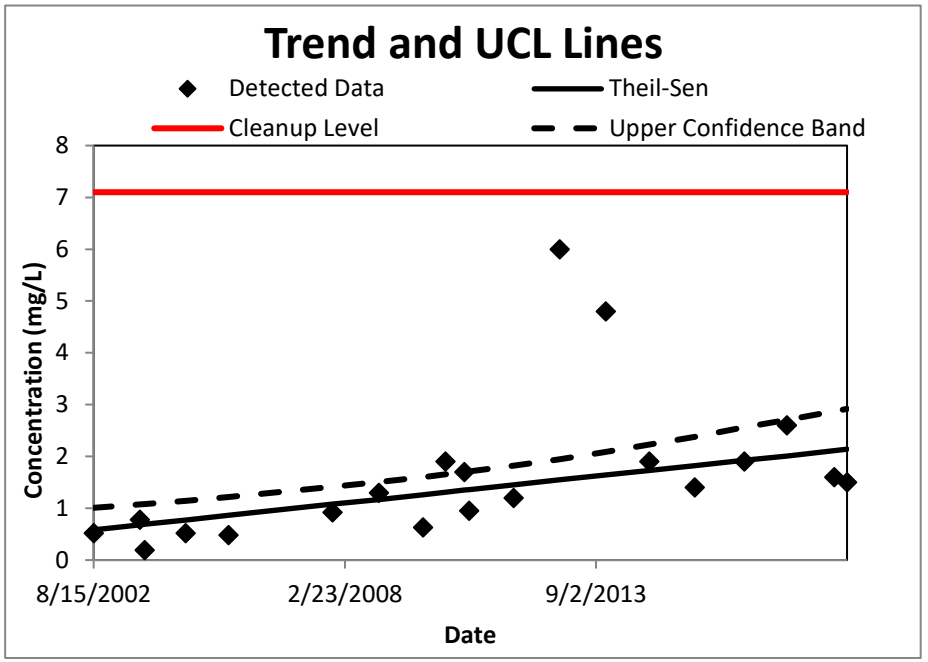
Groundwater Statistics Tool

UCL calculations and summary statistics for nonparametric data sets

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-101
Date Units	Date
Concentration Units	mg/L

Confidence Level	95%
Number of results	20
Number < cleanup level	20
Are any potential outliers present?	Yes
Mean of concentration	1.6
Standard deviation of concentration	1.4



95% Upper Confidence Limit (UCL)	3
Method for calculating UCL	Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	2.92
Trend calculation method	Theil-Sen/Mann-Kendall
Cleanup level	7.1
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**No**

When is the concentration predicted to exceed the MCL?	63000
Random Seed Used	33565.20313
Message: None.	

Groundwater Statistics Tool

Data input worksheet

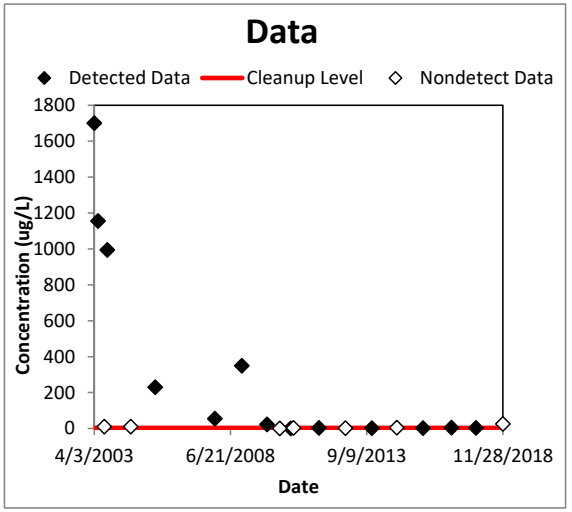
Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	BEHP
Well Name/Number	GW-101
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	3
Source of cleanup level (e.g. MCL or risk-based concentration)	EPA R4
Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	13
Number of nondetect results:	7
Detection frequency:	0.65

Date (Date)	BEHP Concentration (ug/L)	Data Qualifier	Detected? (Yes or No)
4/3/2003	1700		Yes
5/23/2003	1155		Yes
8/21/2003	10	U	No
9/30/2003	995		Yes
8/24/2004	10	U	No
8/3/2005	230		Yes
11/15/2007	54		Yes
11/24/2008	350		Yes
11/13/2009	23		Yes
5/12/2010	0.82	U	No
10/11/2010	1	J	Yes
11/18/2010	2.7	UJ	No
11/9/2011	2.6		Yes
11/15/2012	1.9	U	No
11/20/2013	1.6	J	Yes
11/5/2014	4.9	U	No
11/5/2015	1.6	J	Yes
12/6/2016	4.9	J	Yes
11/14/2017	2.6	J	Yes
11/28/2018	25	U	No



Axis Values			
Time		Concentration	
Min	Max	Min	Max
Auto	Auto	Auto	Auto

Reset Concentration Axis

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value?	Yes	None
Are all data within chart axis limits?	Yes	None

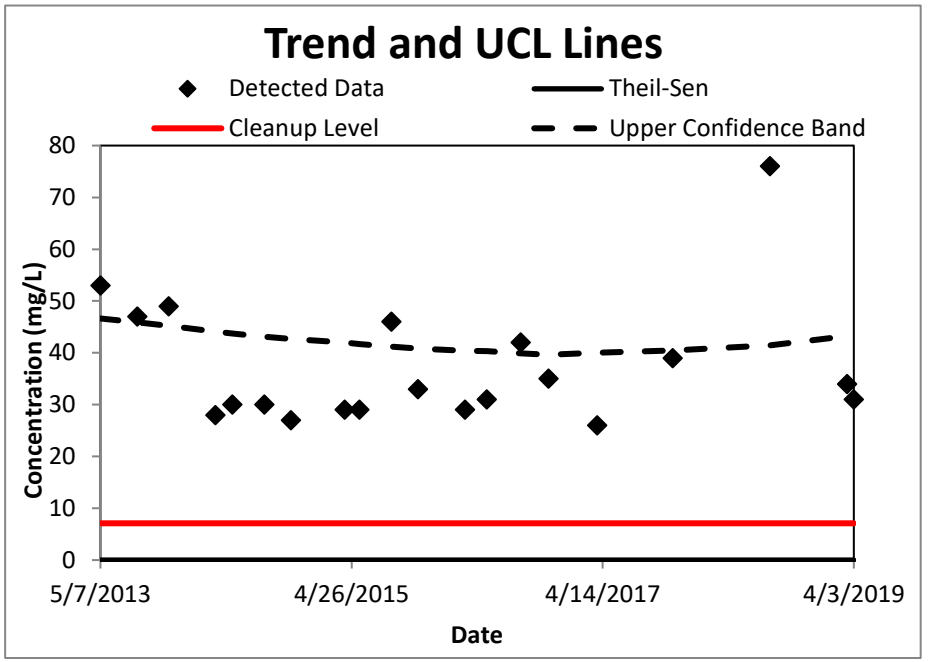
Groundwater Statistics Tool

UCL calculations and summary statistics for nonparametric data sets

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	GW-202S
Date Units	Date
Concentration Units	mg/L

Confidence Level	95%
Number of results	20
Number < cleanup level	0
Are any potential outliers present?	Yes
Mean of concentration	37
Standard deviation of concentration	12



95% Upper Confidence Limit (UCL)	49
Method for calculating UCL	Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	43.4
Trend calculation method	Theil-Sen/Mann-Kendall
Cleanup level	7.1
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Random Seed Used	50063.88281
Message: None.	

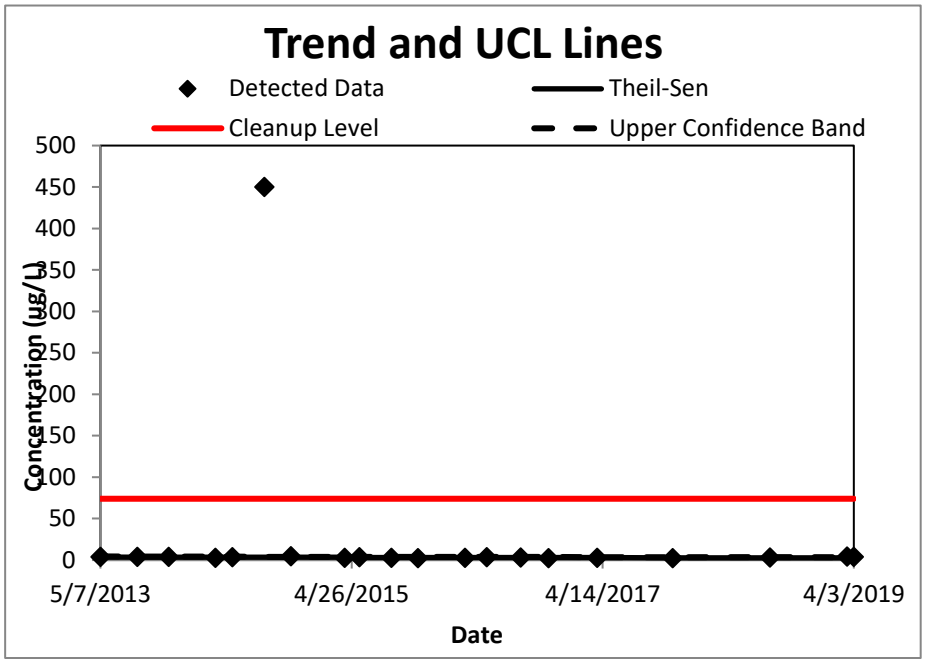
Groundwater Statistics Tool

UCL calculations and summary statistics for nonparametric data sets

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Chromium
Well Name/Number	GW-202S
Date Units	Date
Concentration Units	ug/L

Confidence Level	95%
Number of results	20
Number < cleanup level	19
Are any potential outliers present?	Yes
Mean of concentration	26
Standard deviation of concentration	100



95% Upper Confidence Limit (UCL)	123
Method for calculating UCL	Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	3.65
Trend calculation method	Theil-Sen/Mann-Kendall
Cleanup level	74
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Random Seed Used	50465.32031
Message: None.	

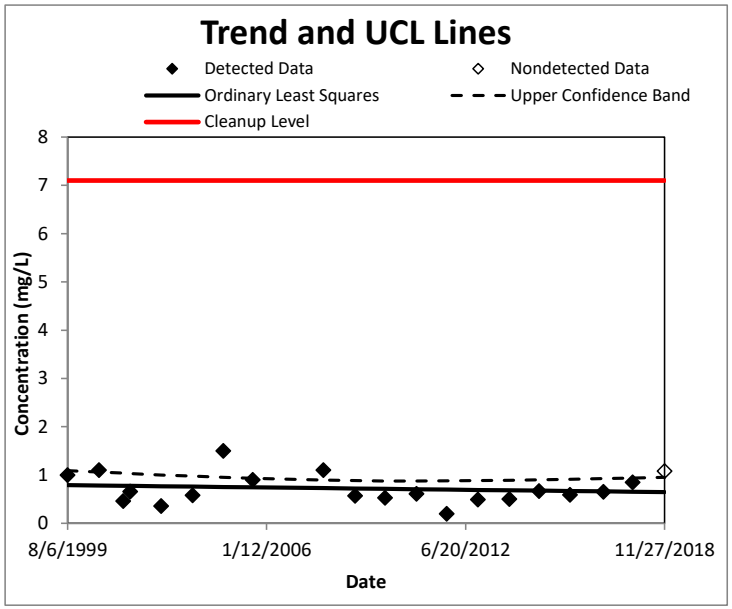
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets with nondetects

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	IW-6
Date Units	Date
Concentration Units	mg/L

Confidence Level	95%
Number of results	20
Number of detected results	19
Number of non-detected results	1
Detection frequency	95%
Number at or below cleanup level	20
Are any potential outliers present?	No
Mean of concentration	0.7
Standard deviation of concentration	0.3



95% Upper Confidence Limit (UCL)	1
Method for calculating UCL	KM Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	0.954
Trend calculation method	Ordinary Least Squares
Cleanup level	7.1
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

Data, including imputed values

Date (Date)	Ammonia Concentration (mg/L)	Data Qualifier	Imputed value*
36378	1		1
36748	1.1		1.1
37034	0.46		0.46
37119	0.66		0.66
37484	0.36		0.36
37854	0.58		0.58
38218	1.5		1.5
38567	0.9		0.9
39401	1.1		1.1
39776	0.57		0.57
40129	0.53		0.53
40500	0.61		0.61
40856	0.2		0.2
41227	0.49		0.49
41598	0.5		0.5
41948	0.67	J	0.67
42313	0.59		0.59
42710	0.65		0.65
43053	0.85		0.85
43431	1.2	U	1.083

* Note that the imputed value column also includes the actual value for detected samples. This is for convenience in copying and pasting the data.

Random Seed Used	34569.65625

Groundwater Statistics Tool

Data input worksheet

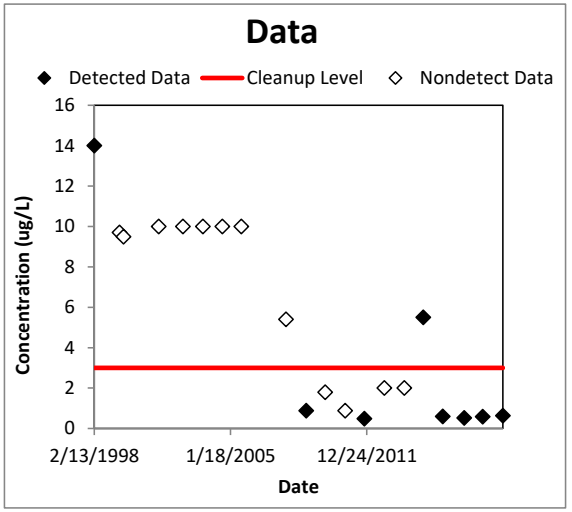
Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	BEHP
Well Name/Number	IW-6
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	3
Source of cleanup level (e.g. MCL or risk-based concentration)	EPA R4
Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	8
Number of nondetect results:	12
Detection frequency:	0.4

Date (Date)	BEHP Concentration (ug/L)	Data Qualifier	Detected? (Yes or No)
2/13/1998	14		Yes
5/26/1999	9.7	U	No
8/6/1999	9.5	U	No
5/23/2001	10	U	No
8/16/2002	10	U	No
8/21/2003	10	U	No
8/19/2004	10	U	No
8/3/2005	10	U	No
11/15/2007	5.4	U	No
11/24/2008	0.88	J	Yes
11/12/2009	1.8	U	No
11/18/2010	0.88	UJ	No
11/9/2011	0.49	J	Yes
11/14/2012	2	U	No
11/20/2013	2	U	No
11/5/2014	5.5		Yes
11/5/2015	0.6	J	Yes
12/6/2016	0.52	J	Yes
11/14/2017	0.58	J	Yes
11/27/2018	0.64	J	Yes



Axis Values			
Time		Concentration	
Min	Max	Min	Max
Auto	Auto	Auto	Auto

Reset Concentration Axis

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value?	Yes	None
Are all data within chart axis limits?	Yes	None

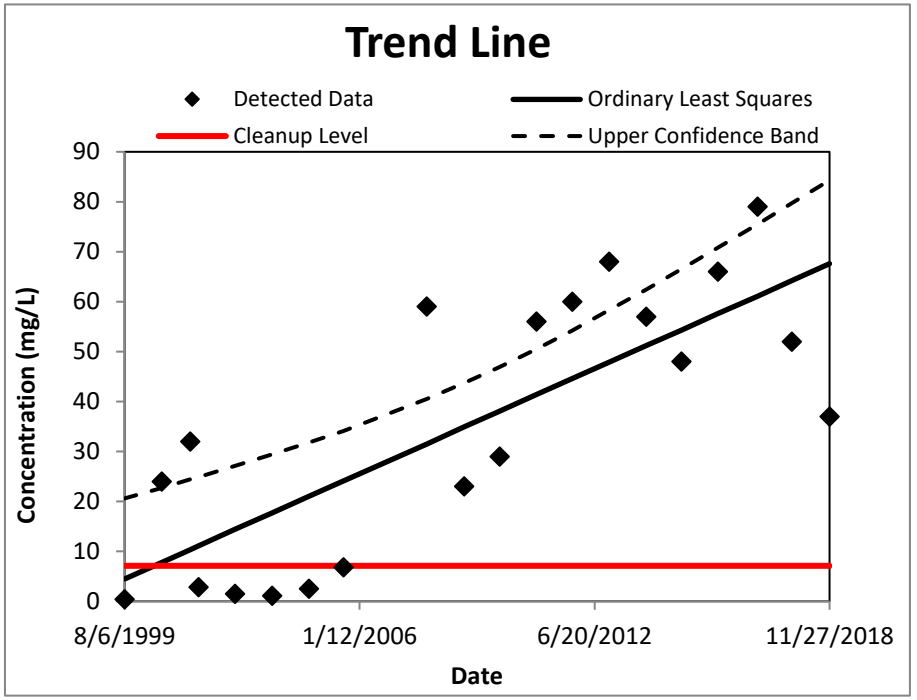
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets that are normally distributed

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	IW-10
Date Units	Date
Concentration Units	mg/L

Confidence Level	95%
Number of results	20
Number < cleanup level	6
Are any potential outliers present?	No
Mean of concentration	35
Standard deviation of concentration	26
t-value for UCL calculation	1.729



95% Upper Confidence Limit (UCL)	45
Method for calculating UCL	Student's t UCL
Value of 95% Upper Confidence Band value at final sampling event	84.3
Trend calculation method	Ordinary Least Squares
Cleanup level	7.1
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**No**

When is the concentration predicted to exceed the MCL?	MCL is already exceeded
Message: None.	

Groundwater Statistics Tool

Data input worksheet

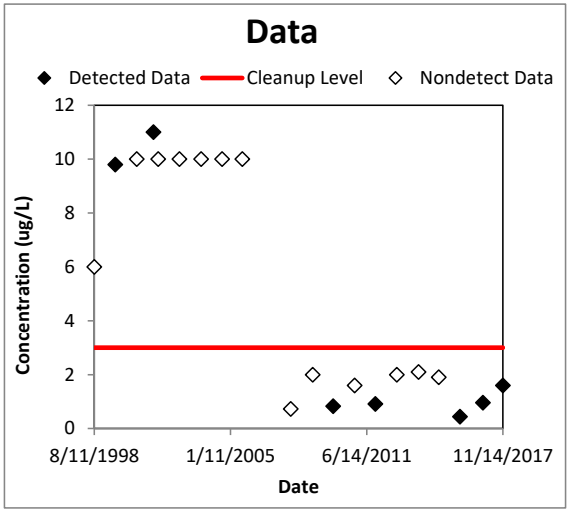
Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	BEHP
Well Name/Number	IW-10
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	3
Source of cleanup level (e.g. MCL or risk-based concentration)	EPA R4
Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	
Significant figures to use	2

Number of data points:	20
Number of detected results:	7
Number of nondetect results:	13
Detection frequency:	0.35

Date (Date)	BEHP Concentration (ug/L)	Data Qualifier	Detected? (Yes or No)
8/11/1998	6	U	No
8/6/1999	9.8		Yes
8/10/2000	10	U	No
5/23/2001	11		Yes
8/16/2001	10	U	No
8/16/2002	10	U	No
8/21/2003	10	U	No
8/19/2004	10	U	No
8/3/2005	10	U	No
11/15/2007	0.73	U	No
11/24/2008	2	U	No
11/12/2009	0.83	J	Yes
11/18/2010	1.6	UJ	No
11/9/2011	0.91	J	Yes
11/14/2012	2	U	No
11/20/2013	2.1	U	No
11/5/2014	1.9	U	No
11/5/2015	0.44	J	Yes
12/6/2016	0.96	J	Yes
11/14/2017	1.6	J	Yes



Axis Values			
Time		Concentration	
Min	Max	Min	Max
Auto	Auto	Auto	Auto

Reset Concentration Axis

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value?	Yes	None
Are all data within chart axis limits?	Yes	None

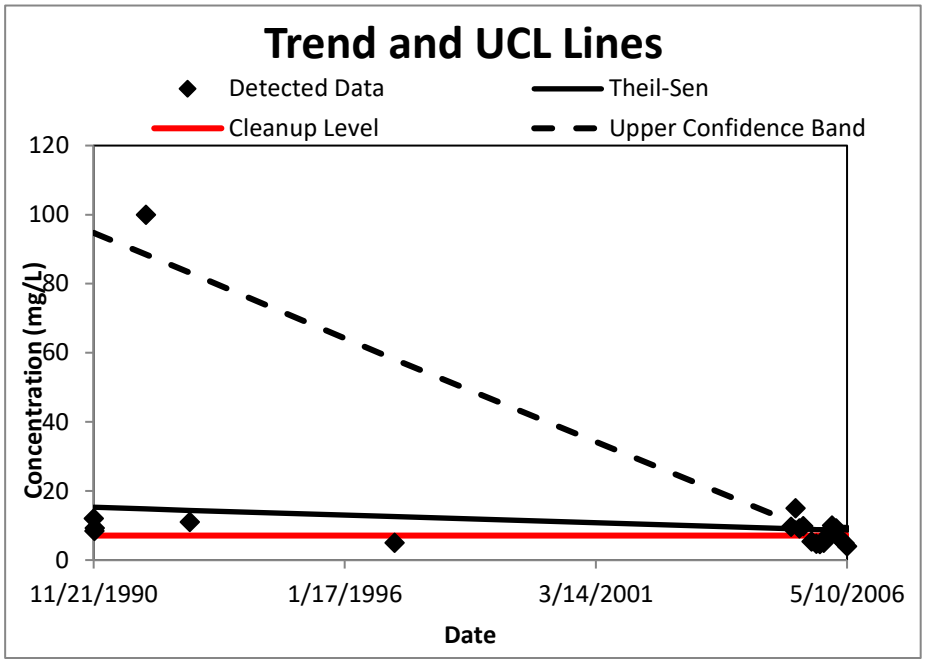
Groundwater Statistics Tool

UCL calculations and summary statistics for nonparametric data sets

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	IW-11
Date Units	Date
Concentration Units	mg/L

Confidence Level	95%
Number of results	20
Number < cleanup level	8
Are any potential outliers present?	Yes
Mean of concentration	13
Standard deviation of concentration	21



95% Upper Confidence Limit (UCL)	33
Method for calculating UCL	Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	9.35
Trend calculation method	Theil-Sen/Mann-Kendall
Cleanup level	7.1
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Random Seed Used	36028.05469
Message: None.	

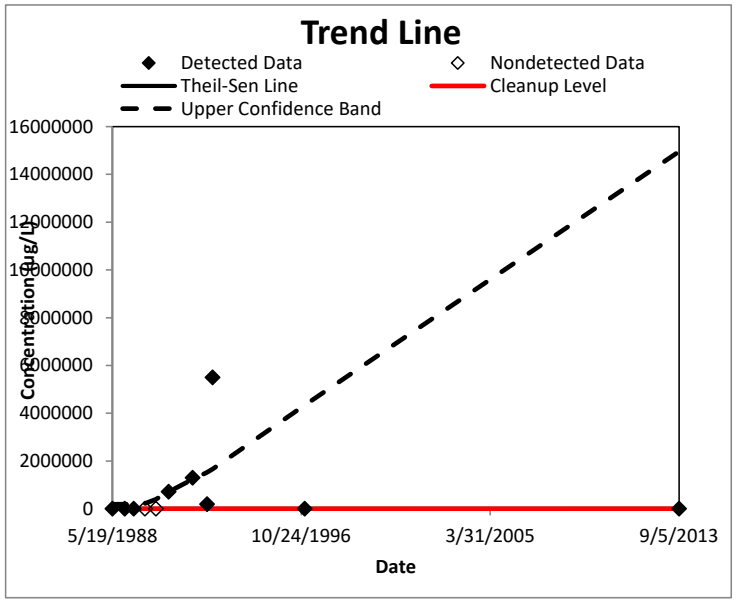
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets with nondetects

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	BEHP
Well Name/Number	IW-11
Date Units	Date
Concentration Units	ug/L

Confidence Level	95%
Number of results	11
Number of detected results	9
Number of non-detected results	2
Detection frequency	82%
Number at or below cleanup level	0
Are any potential outliers present?	Yes
Mean of concentration	700000
Standard deviation of concentration	1600000



95% Upper Confidence Limit (UCL)	2900000
Method for calculating UCL	KM Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	15000000
Trend calculation method	Theil-Sen/Mann-Kendall
Cleanup level	3
Source of cleanup level	EPA R4
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

Data, including imputed values

Date (Date)	BEHP Concentration (ug/L)	Data Qualifier	Imputed value*
32282	270		270
32485	390		390
32629	120		120
32813	50	U	1.988
32994	10	U	8.96
33198	710000		710000
33589	1300000		1300000
33828	190000	J	190000
33918	5500000	B	5500000
35417	30	JB	30
41523	8.7		8.7

* Note that the imputed value column also includes the actual value for detected samples. This is for convenience in copying and pasting the data.

Random Seed Used	37452.30859

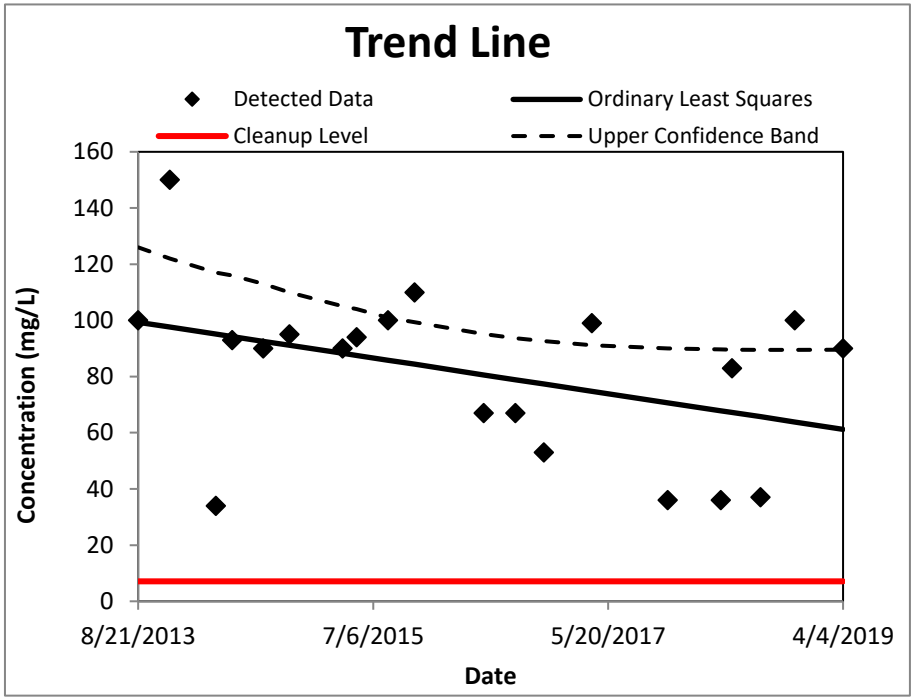
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets that are normally distributed

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	PZ-16RRR
Date Units	Date
Concentration Units	mg/L

Confidence Level	95%
Number of results	20
Number < cleanup level	0
Are any potential outliers present?	No
Mean of concentration	81
Standard deviation of concentration	30
t-value for UCL calculation	1.729



95% Upper Confidence Limit (UCL)	93
Method for calculating UCL	Student's t UCL
Value of 95% Upper Confidence Band value at final sampling event	89.6
Trend calculation method	Ordinary Least Squares
Cleanup level	7.1
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

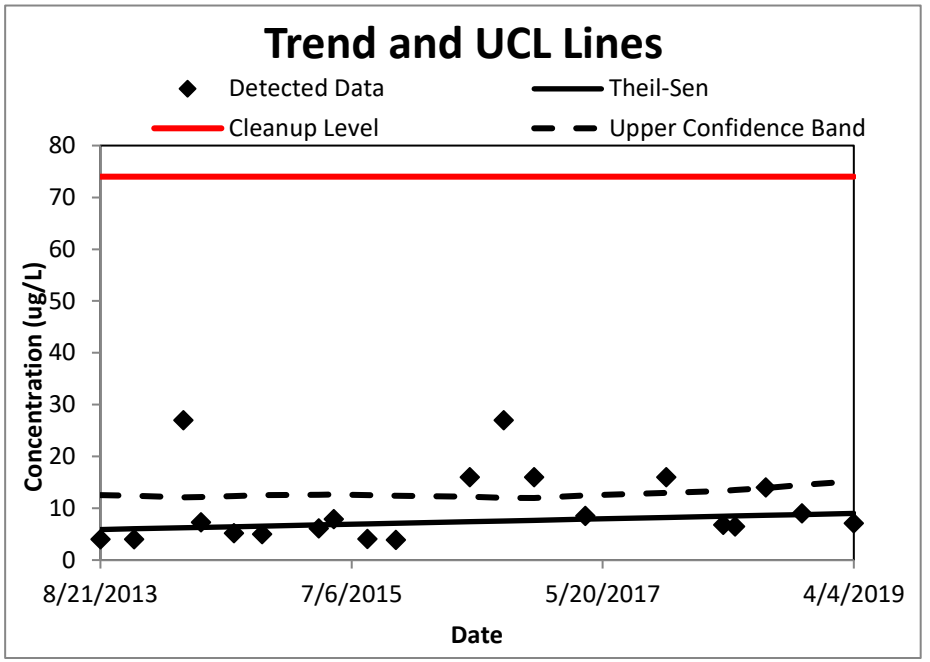
Groundwater Statistics Tool

UCL calculations and summary statistics for nonparametric data sets

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Chromium
Well Name/Number	PZ-16RRR
Date Units	Date
Concentration Units	ug/L

Confidence Level	95%
Number of results	20
Number < cleanup level	20
Are any potential outliers present?	No
Mean of concentration	10
Standard deviation of concentration	7.1



95% Upper Confidence Limit (UCL)	17
Method for calculating UCL	Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	15.2
Trend calculation method	Theil-Sen/Mann-Kendall
Cleanup level	74
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Random Seed Used	53761.55078
Message: None.	

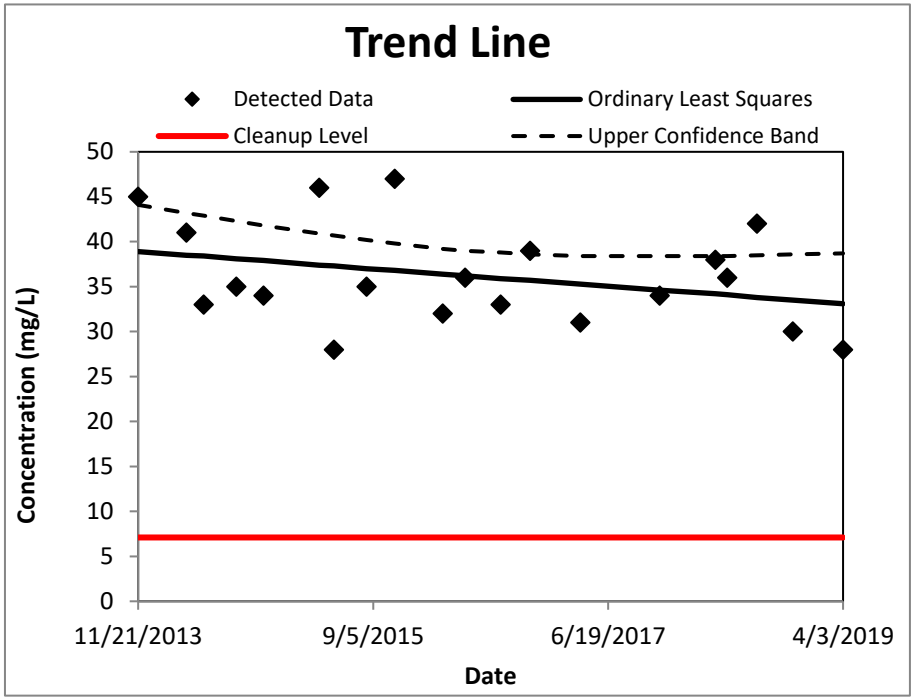
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets that are normally distributed

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	PZ-17RRR
Date Units	Date
Concentration Units	mg/L

Confidence Level	95%
Number of results	20
Number < cleanup level	0
Are any potential outliers present?	No
Mean of concentration	36
Standard deviation of concentration	5.7
t-value for UCL calculation	1.729



95% Upper Confidence Limit (UCL)	38
Method for calculating UCL	Student's t UCL
Value of 95% Upper Confidence Band value at final sampling event	38.7
Trend calculation method	Ordinary Least Squares
Cleanup level	7.1
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

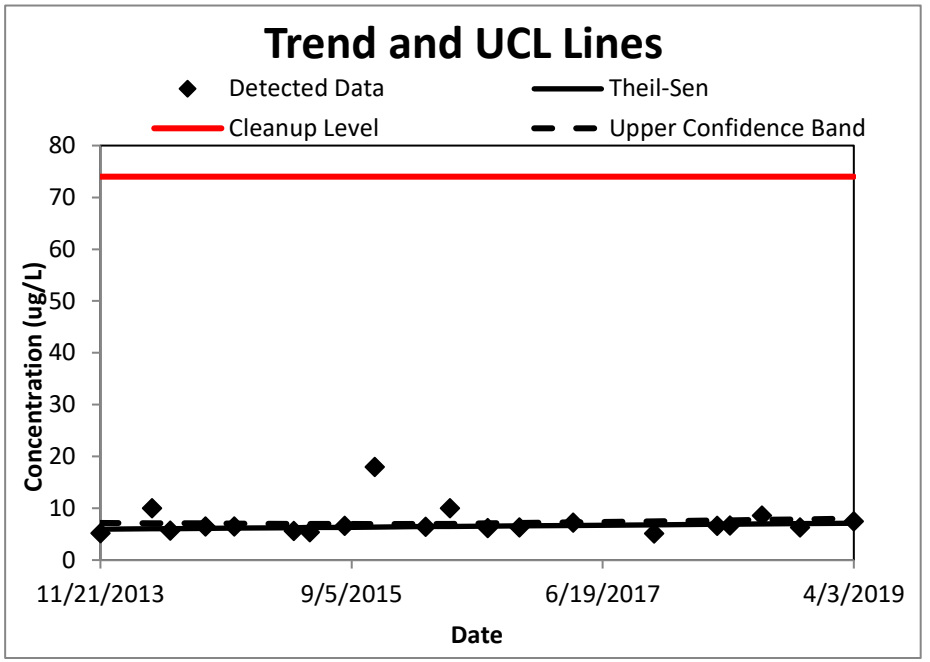
Groundwater Statistics Tool

UCL calculations and summary statistics for nonparametric data sets

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Chromium
Well Name/Number	PZ-17RRR
Date Units	Date
Concentration Units	ug/L

Confidence Level	95%
Number of results	20
Number < cleanup level	20
Are any potential outliers present?	Yes
Mean of concentration	7.3
Standard deviation of concentration	2.9



95% Upper Confidence Limit (UCL)	10
Method for calculating UCL	Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	8.02
Trend calculation method	Theil-Sen/Mann-Kendall
Cleanup level	74
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Random Seed Used	54720.39063
Message: None.	

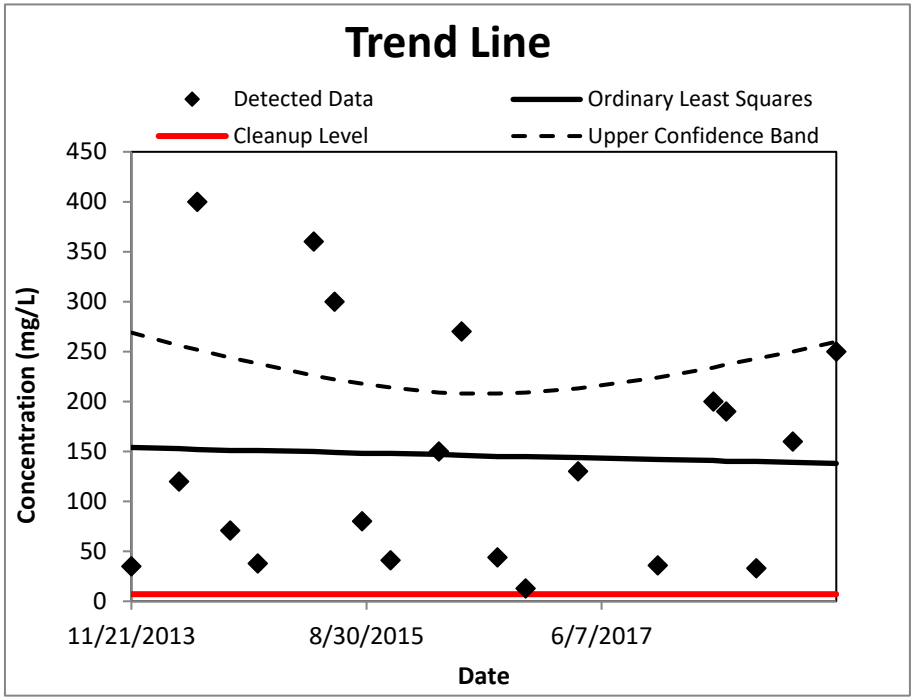
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets that are normally distributed

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Ammonia
Well Name/Number	PZ-18R
Date Units	Date
Concentration Units	mg/L

Confidence Level	95%
Number of results	20
Number < cleanup level	0
Are any potential outliers present?	No
Mean of concentration	150
Standard deviation of concentration	120
t-value for UCL calculation	1.729



95% Upper Confidence Limit (UCL)	200
Method for calculating UCL	Student's t UCL
Value of 95% Upper Confidence Band value at final sampling event	260
Trend calculation method	Ordinary Least Squares
Cleanup level	7.1
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

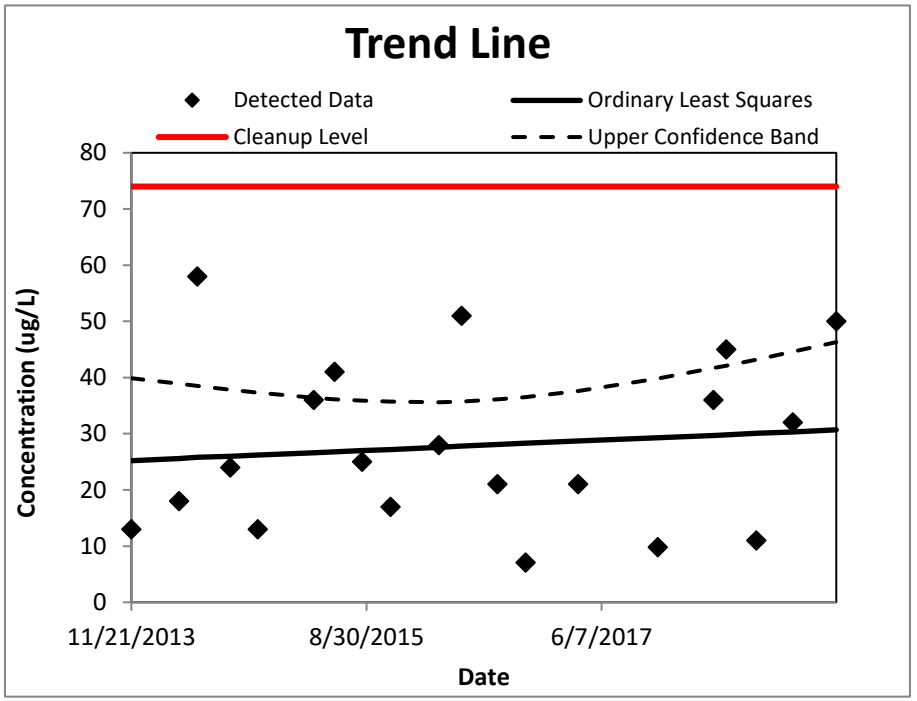
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets that are normally distributed

Site Name	Olin
Operating Unit (OU)	OU3
Type of Evaluation	Remediation
Date of Evaluation	10/1/2019
Person performing analysis	J. Lambert

Chemical of Concern	Chromium
Well Name/Number	PZ-18R
Date Units	Date
Concentration Units	ug/L

Confidence Level	95%
Number of results	20
Number < cleanup level	20
Are any potential outliers present?	No
Mean of concentration	28
Standard deviation of concentration	15
t-value for UCL calculation	1.729



95% Upper Confidence Limit (UCL)	34
Method for calculating UCL	Student's t UCL
Value of 95% Upper Confidence Band value at final sampling event	46.3
Trend calculation method	Ordinary Least Squares
Cleanup level	74
Source of cleanup level	AWQC
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	